PIT AND QUARRY

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MAY, 1941

Current Developments in the Lime Industry . . . Fluorspar by Flotation
Aggregates for the Friant Dam . . . Looking Inside the Abrasion Machine

LUDLOW-SAYLOR

CONTROLLED-TEMPER SUPER-LOY WOVEN WIRE SCREENS

for super-severe service

●

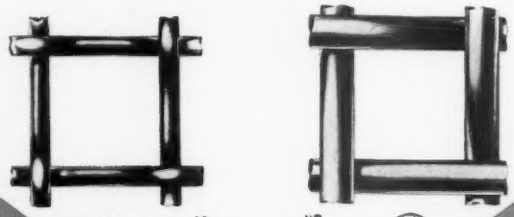
SUPER-HARD, SUPER-TOUGH, SUPER-STRONG

CONTROLLED-TEMPER SUPER-LOY WOVEN WIRE SCREENS

withstand abrasion longer—

endure vibration better—

resist fatigue to the utmost



The background at top of page shows the "Perfect" Double-Crimp Weave.

The small cuts in the center panel compare Arch-Crimp Weave and Double-Crimp Weave.

The border at foot of page shows "Perfect" Double-Crimp Steel Wire Cloth which has been hot-dip galvanized after weaving.

Samples on request.

The LUDLOW-SAYLOR WIRE COMPANY SAINT LOUIS

S-A *presents*

TWO MORE OUTSTANDING MATERIAL HANDLING JOBS..

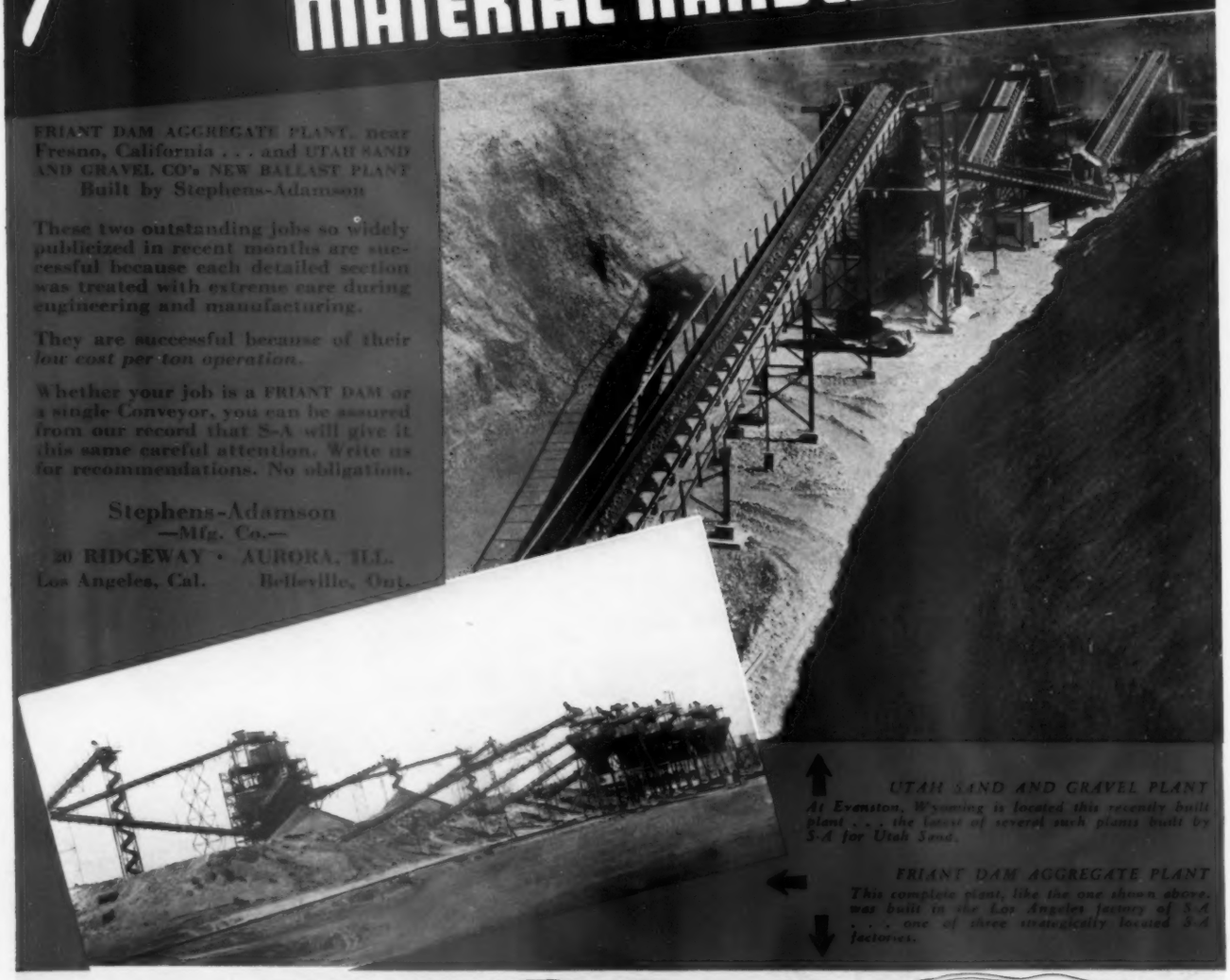
FRIANT DAM AGGREGATE PLANT, near Fresno, California . . . and UTAH SAND AND GRAVEL CO's NEW BALLAST PLANT
Built by Stephens-Adamson

These two outstanding jobs so widely publicized in recent months are successful because each detailed section was treated with extreme care during engineering and manufacturing.

They are successful because of their *low cost per ton operation.*

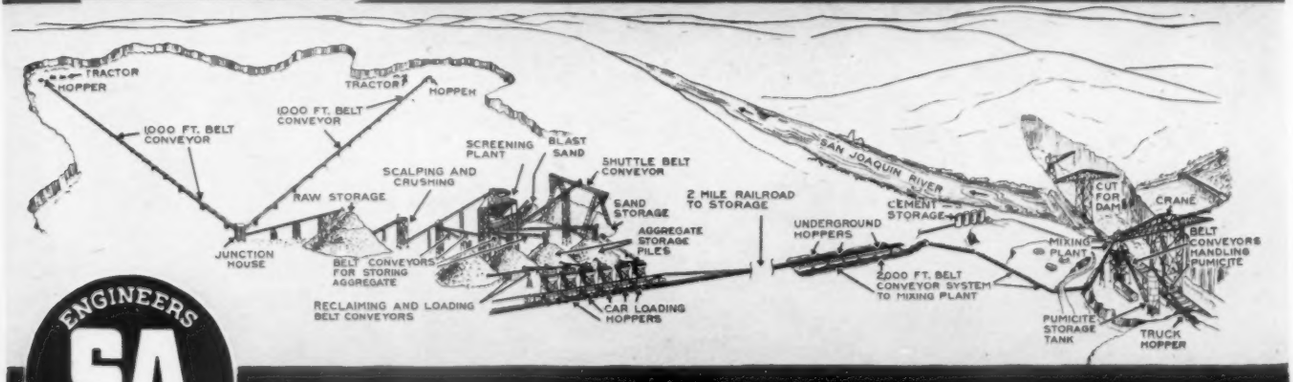
Whether your job is a FRIANT DAM or a single Conveyor, you can be assured from our record that S-A will give it this same careful attention. Write us for recommendations. No obligation.

Stephens-Adamson
—Mfg. Co.—
20 RIDGEWAY · AURORA, ILL.
Los Angeles, Cal. Belleville, Ont.



UTAH SAND AND GRAVEL PLANT
At Evanston, Wyoming is located this recently built plant . . . the latest of several such plants built by S-A for Utah Sand.

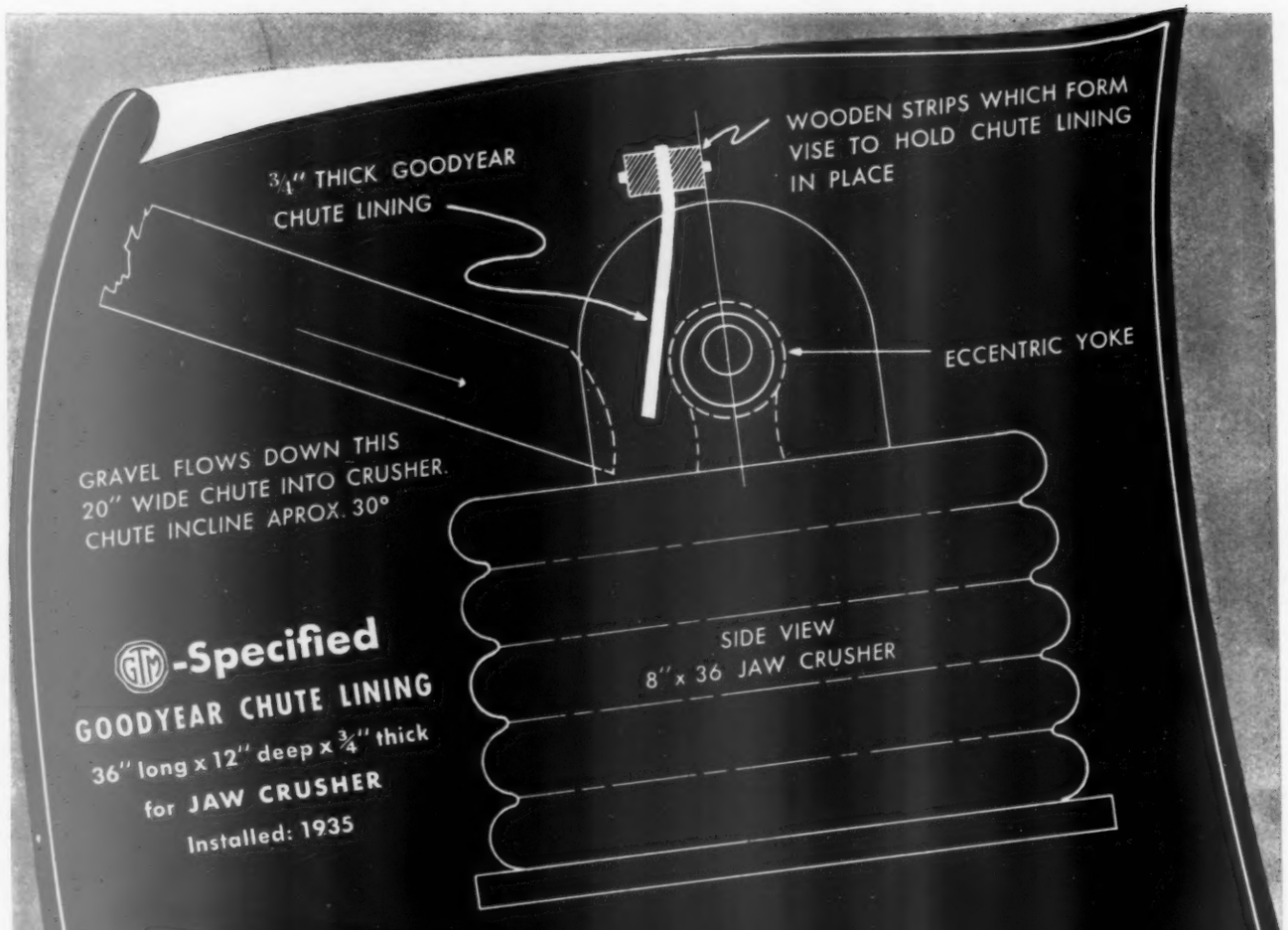
FRIANT DAM AGGREGATE PLANT
This complete plant, like the one shown above, was built in the Los Angeles factory of S-A . . . one of three strategically located S-A factories.



ENGINEERS SA MANUFACTURERS

STEPHENS-ADAMSON CONVEYORS

PIT AND QUARRY, May, 1941, Vol. 33, No. 11. Published monthly by the Complete Service Publishing Company, 538 South Clark Street, Chicago, Ill. Subscription price $1 for 1 year in the U. S. and possessions, Canada, Central and South America; elsewhere $1 additional for each year. Single copies 20 cents. Entered as second-class matter February 28, 1932, at the Post Office at Chicago, Ill., under the Act of March 3, 1897.


3/4" THICK GOODYEAR CHUTE LINING
WOODEN STRIPS WHICH FORM VISE TO HOLD CHUTE LINING IN PLACE
ECCENTRIC YOKE
GRAVEL FLOWS DOWN THIS 20" WIDE CHUTE INTO CRUSHER. CHUTE INCLINE APROX. 30°
GTM-Specified
GOODYEAR CHUTE LINING
36" long x 12" deep x 3/4" thick
for JAW CRUSHER
Installed: 1935
SIDE VIEW
8" x 36 JAW CRUSHER

IT'S BEEN HOLDING UP A *Rock Slide* FOR SIX YEARS!

To protect the eccentric yoke in its jaw crusher from the impact of tons of rock, a West Coast sand and gravel company was using baffle plates made of ½" vanadium steel. But so great was the abrasion, these heavy metal plates wore out in six to seven weeks. Result was frequent shutdowns for replacement.

Then, in 1935, the management turned to the G.T.M. – Goodyear Technical Man. He recommended replacing the baffle with a sheet of Goodyear Rubber Chute Lining ¾" thick. Today, six years later, this same rubber guard is still doing a fine job. It has already lasted about forty-five times as long as the highest-quality vanadium plate —and looks tough and durable enough to stand a few more years of this brutal service.

Goodyear Chute Lining is made of the most abrasion-resistant rubber it is possible to compound. In handling crushed rock, ores and coal it adds years to equipment life. Why not ask the G.T.M. to apply the advantages of Goodyear Chute Lining to your abrasion problem? To bring him to your office, write: Goodyear, Akron, Ohio or Los Angeles, California – or phone the nearest Goodyear Mechanical Rubber Goods Distributor.

THE GREATEST NAME IN RUBBER

GOODYEAR

It's a Real Rock Shovel

OR VALLEY DOLOMITE

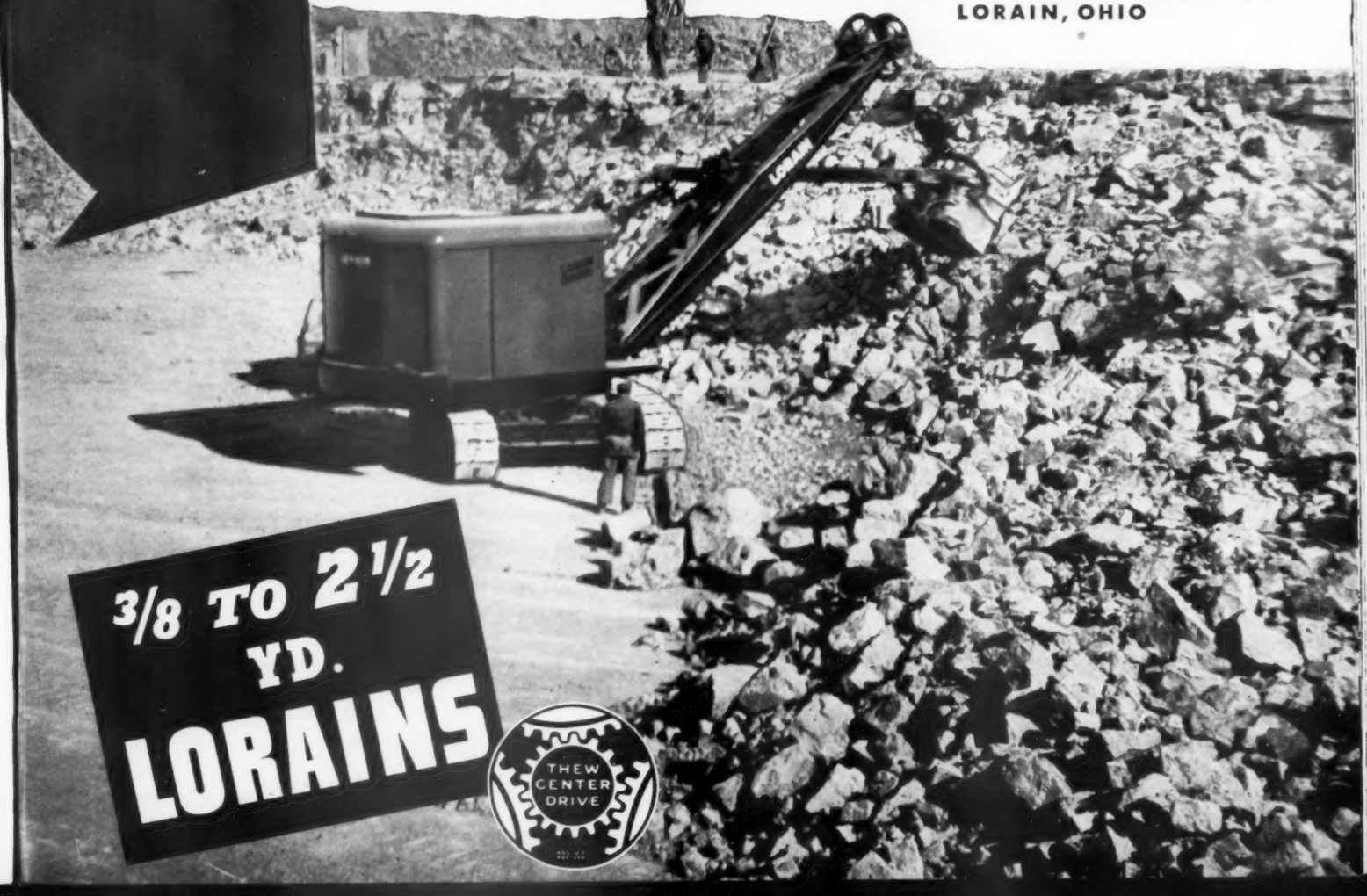
WOULDN'T HAVE IT

• You don't pick a shovel at random for digging like this—and stay in business. This is the second 1½-yd. Lorain purchased by Valley Dolomite of Bonne Terre, Mo. If the first unit hadn't proved to be a *rock* shovel in the truest sense of the word, the second would have never set foot on the floor of this quarry.

Every shovel in the ⅜ to 2½-yd. Lorain line has won recognition for its work in rock. And here are the features that do the trick—Center Drive design of turntable which produces increased capacities for handling more and heavier work; simplifies and strengthens construction throughout; and, most important of all, gives a direct flow of power that can be concentrated back of the dipper when you want to really bear down in tough digging. Lorain shovel booms are built to resist stress and strain; and every unit travels on a rugged, 2-speed crawler designed for maximum stability and ease of handling.

If you have rock to move—there's a shovel in the ⅜ to 2½-yd. Lorain line that's ready, willing and able to swing the job at a saving to you. Write for catalogs today.

THE THEW SHOVEL COMPANY
LORAIN, OHIO



3/8 TO 2 1/2 YD. LORAINS

THEW CENTER DRIVE

"Bethlehem stone-sawing strand cut our costs 30%" *says general manager of large Tennessee quarry*

Here's what J. B. Jones, Jr., general manager of Grey Knox quarries, in Tennessee, has to say about Bethlehem Stone-Sawing strand:

"We have thoroughly tested Bethlehem Stone-Sawing strand on our various properties, and on the basis of the results have adopted it for exclusive use. Bethlehem strand is easier to handle. This strand is less liable to kink—and, if a kink does occur, it can be satisfactorily straightened out. Bethlehem strand wears more uniformly, lasts longer than other brands we have used. Everything considered, Bethlehem Stone-Sawing strand has cut our strand costs at least 30 per cent."

If you use Stone-Sawing strand, why not consider Bethlehem as your source of supply. Bethlehem strand is made of top-quality steel, and is turning in remarkable performances in quarries everywhere. It's a real time and money saver.

BETHLEHEM STEEL COMPANY

3000 TONS OF ORE PER DAY WITH THIS DENVER "SUB-A" FLOTATION MACHINE LARGEST MECHANICAL TYPE UNIT BUILT

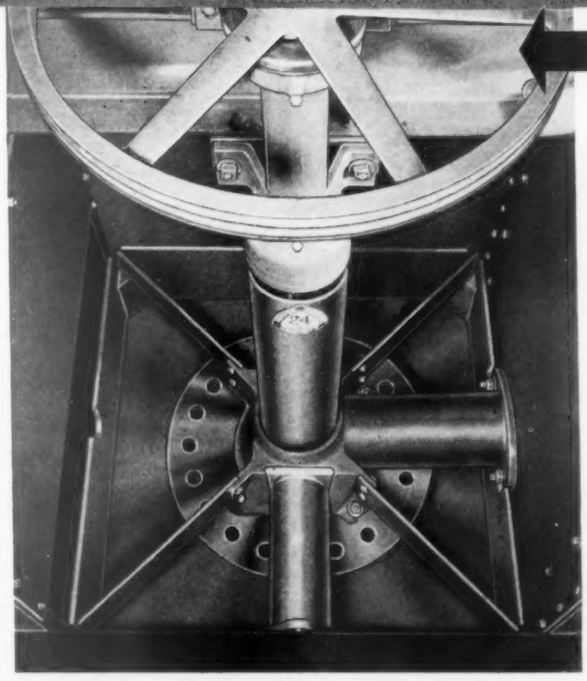
APPLICATION

No application is too large, too difficult, or too complex for this No. 30 Denver "Sub-A" (Fahrenwald) Flotation Machine.

Now **ONE** Denver "Sub-A" will handle the pulp from several large grinding circuits, thus simplifying the flotation operation.

This No. 30 Denver "Sub-A" will handle 3,000 tons of dry ore at 40% solids down to 1,000 tons at 15% solids. The volume of each cell is 100 cubic feet, the largest of any mechanical type cell yet built

Where large tonnages must be treated by a rougher machine at lowest cost this unit is ideal for such a plant. Wherever installed, the Denver "Sub-A" will give highest metallurgical efficiency per horsepower.



CELL DESIGN

In designing this large cell, simplicity and flexibility have been retained . including the exclusive method of circulating pulp from cell to cell by gravity.

An impeller of sloping design, in combination with a new diffuser plate, allows operation at a higher speed with no increase in horsepower. this higher speed produces better aeration with more rougher froth per unit of cell surface.

The diffuser plate and impeller can be made of molded rubber having 6 to 11 times the life of hard iron Rubber bottom liners and heavy metal side liners minimize interior cell wear.

Already outstanding in the flotation field, these Denver "Sub-A" advances are further reducing the present low flotation costs.

Write today for Bulletin No. F11-B which gives information on flotation of non-metallics

USE OUR BATCH AND CONTINUOUS ORE TESTING FACILITIES

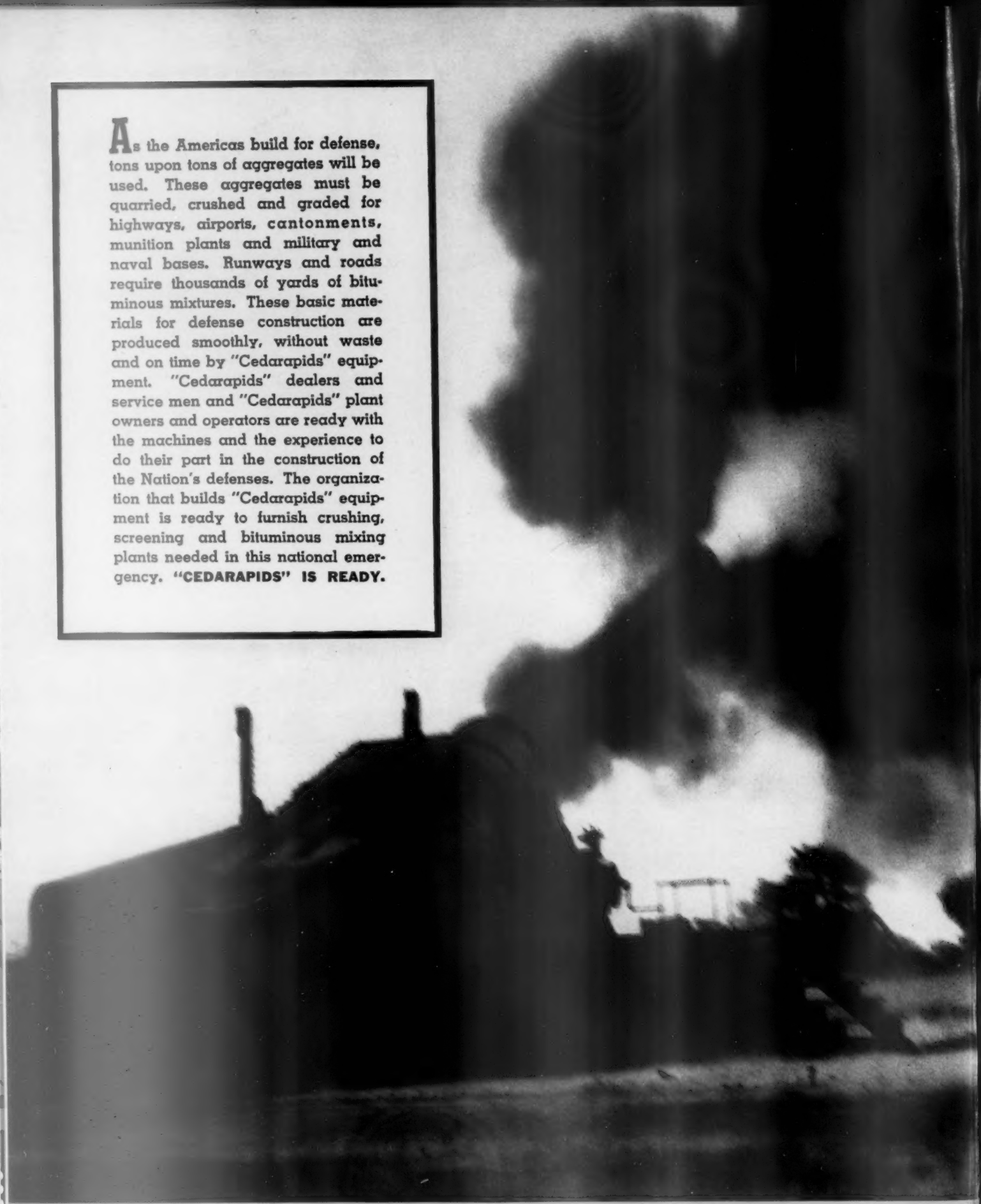
DENVER EQUIPMENT 24 HOUR SERVICE COMPANY

NEW YORK CITY, NEW YORK: 50 Church Street
CHICAGO: Suite 1005, 69 W. Washington Street
SALT LAKE CITY, UTAH: 727 McIntyre Building
TORONTO, ONTARIO: 45 Richmond Street West
MIDDLESEX, ENG.: 493A, Northolt Road, S. Harrow
MEXICO, D.F.: Boker Bldg., 16 de Septiembre 58
SANTIAGO, CHILE - - - - LIMA, PERU
JOHANNESBURG, SO. AFRICA: 8 Village Road

STANDARD RELIABLE 24 HOUR SERVICE EFFICIENT

DENVER EQUIPMENT COMPANY, 1400 17th St., Denver, Colorado

As the Americas build for defense, tons upon tons of aggregates will be used. These aggregates must be quarried, crushed and graded for highways, airports, cantonments, munition plants and military and naval bases. Runways and roads require thousands of yards of bituminous mixtures. These basic materials for defense construction are produced smoothly, without waste and on time by "Cedarapids" equipment. "Cedarapids" dealers and service men and "Cedarapids" plant owners and operators are ready with the machines and the experience to do their part in the construction of the Nation's defenses. The organization that builds "Cedarapids" equipment is ready to furnish crushing, screening and bituminous mixing plants needed in this national emergency. **"CEDARAPIDS" IS READY.**

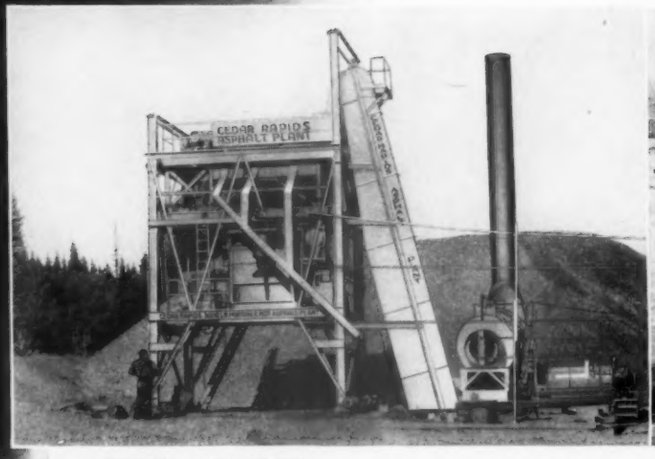


IOWA MANUFACTURING COMPANY

CEDAR RAPIDS • IOWA • U.S.A.

Cedarapids is Ready

WITH A COMPLETE LINE OF PORTABLE OR STATIONARY CRUSHING, SCREENING, WASHING, BITUMINOUS MIXING AND MATERIAL HANDLING EQUIPMENT FOR CONSTRUCTION OF CANTONMENTS . . . AIRPORTS . . . ROADS . . . AND OTHER DEFENSE REQUIREMENTS.



ASPHALT PLANTS . . The most complete line in the industry. Plant capacities ranging from 1000 to 4000 pounds, either portable or stationary. Batch type or continuous type mixers. A plant to meet any bituminous specifications.

GRAVEL PLANTS . . Complete Gravel Crushing and Screening plants for big production of aggregates at low cost. Cedarapids Gravel Plants are built in many sizes and combinations. They meet every requirement.

ROCK PLANTS . . Regardless of the tonnage involved, Cedar Rapids has the plant, either portable or stationary, to do the job. A complete line of jaw and roll crushers in a large variety of combinations makes this possible.

CEDARAPIDS PORTABLE STABILIZER PLANT . . A big capacity, continuous-mix type plant for mixing clay and gravel with any specified binder. Proportions accurately, mixes thoroughly and is completely portable. A high production, dual-purpose plant with a low operating cost.

WRITE US FOR BULLETINS AND FURTHER DETAILS

SKF-equipped trunnion roller on one of nine rotating dry kilns built by Standard Steel Corporation and located at West End, California, since 1933.

They've Been Busy

ON KILNS SINCE 1933

Lubrication is a BIG problem in remote desert areas where the temperature soars up to 120 degrees in the Summer and the surrounding dryer temperature is higher at all times. And the Standard Steel Corporation solved it by installing SKF Spherical Roller bearings on trunnion rollers and roll shafts, for these bearings require only infrequent attention, have high load carrying capacity, and assure dependable performance. In fact, there's been no complaint of bearing trouble since nine of these kilns went to work back in 1933. Isn't *that* the kind of bearing performance *you* want?

SKF INDUSTRIES, INC., PHILA., PA.

4797

ROLLER SKF BEARINGS

America DIGS IN

WHEN America decided to dig in, her first demand was for cantonments, enlarged factory capacities, airports and air and naval repair bases. Without these fundamental things she could not train her men, build their weapons or sustain her new power.

A dirt-moving job, this all-important preliminary work for the defense of this country. An emergency call for rock-busting, volume-boosting, dirt-moving power and for men to wield that power against time and weather!

"Caterpillar" Diesel power in tractors, engines and road machinery, which was already at work building those things worth fighting for, was ready to create the means with which they could be protected. And while most of the nation groans under an overload, these machines and the men that own them are pitching in on basic defense projects without breaking their stride.

The yardage being moved in this country today would be looked upon as a miracle in any other country in the world. America is really digging in . . . and digging with the tools which have made her famous and which will assure her continued security.

The extension of the defense program places heavy demands on the men in the dirt-moving industry and on the manufacturers who furnish them with the tools for this necessary work . . . big things have been done, big things have yet to be done.

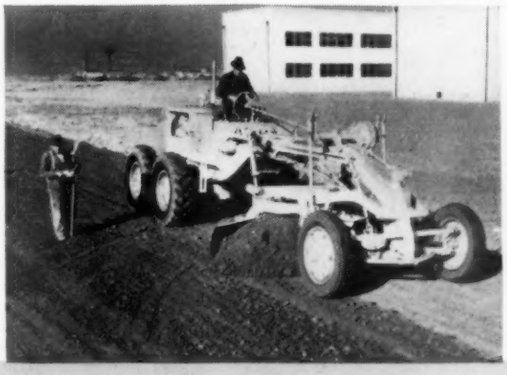
CATERPILLAR TRACTOR CO., PEORIA, ILL.

(ABOVE) • *Whipping winter's worst conditions to expand the Glenn L. Martin Company's plane plant.*

(AT RIGHT) • *Huge scraper-units hasten the building of California's Camp Callan.*

(LOWER LEFT) • *This machine will give an air station fast roads, smooth runways.*

(LOWER RIGHT) • *Jack-hammers powder rock as "Caterpillar" Diesel Engines drive compressors.*



CATERPILLAR *DIESEL*

REG. U.S. PAT. OFF.

ENGINES AND ELECTRIC SETS • TRACK-TYPE TRACTORS • ROAD MACHINERY

For ROCK BOTTOM COSTS

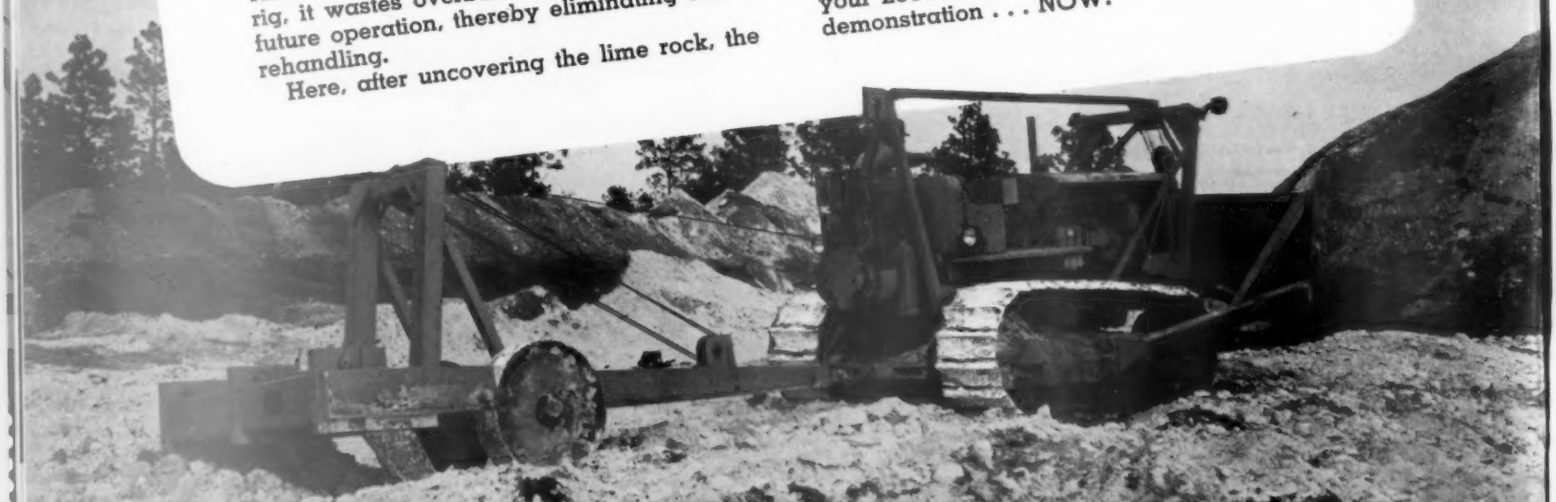
Use This LeTourneau Carryall-Rooter-'Dozer Method...

Step up pit and quarry production the low-cost way so many other successful operators are doing . . . by using LeTourneau equipment for stripping and handling materials.

Take the Dixie Lime Rock Company, of Ocala, Florida, for instance: By using a LeTourneau LS (11 heaped yards) Carryall Scraper to strip overburden from their Hendricks quarry, they've combined loading, hauling and dumping into one continuous cycle of low-cost operation. In work like this, the Carryall strips capacity loads just as efficiently along the last few inches of overburden as it does on a 30-foot layer. And because the Carryall is a long-haul rig, it wastes overburden beyond range of future operation, thereby eliminating costly rehandling.

Here, after uncovering the lime rock, the Carryall is dropped and a LeTourneau Bulldozer and Heavy-Duty Rooter connected to the same "Caterpillar" tractor and LeTourneau Two-Drum Power Control Unit, to save blasting by Rooting the lime rock. The Bulldozer windrows the broken limestone for quick shovel pickup.

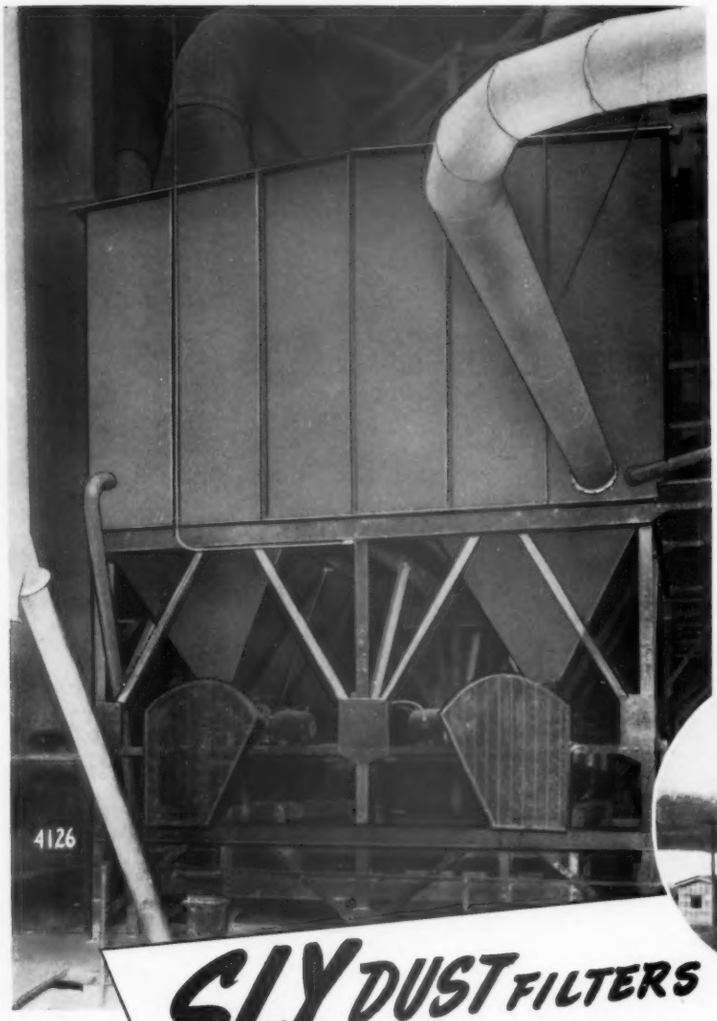
In your case this same time and money-saving LeTourneau stripping equipment can also build your truck roads, shove materials to hoppers, haul and stockpile materials and handle dozens of odd jobs. Try it right on your own property by calling your LeTourneau-"Caterpillar" dealer for a demonstration . . . NOW!



CARRYALL* SCRAPERS, ANGLEDOZERS*, BULLDOZERS, ROOTERS*, POWER CONTROL UNITS, CRANES, PUSH-DOZERS, SHEEP'S FOOT ROLLERS, TOURNATRAILERS*, TOURNAPULLS*, TOURNACRANE.* *Name Reg. U.S. Pat. Off.

LETOURNEAU

PEORIA, ILLINOIS • STOCKTON, CALIFORNIA



• There are three Sly Dust Filters in use in this plant. The one shown at left filters the fines out of 41,000 cu. ft. of air per minute, exhausting crushers, grinders, magnetic separators, screens and conveyors. The collected fines are conveyed continuously from the filter hoppers to two 75-ton storage tanks.

• Processing plant of the American Nepheline Corp., Rochester, N. Y.

SLY DUST FILTERS GAVE THE AMERICAN NEPHELINE CORP. THESE *Exclusive* ADVANTAGES

1 ***More Filtering Cloth.*** Sly gives many more square feet of *effective* filter cloth area, hence greater filtering capacity per cubic foot of space.

2 ***Taut Bags.*** This patented feature insures: (1) a constant *minimum* resistance to the air, and (2) quick, thorough dust removal since the *entire* bag is vibrated *uniformly* during shaking.

3 ***Simpler Shaker Mechanism.*** Consists of many less moving parts, resulting in less maintenance and lower costs.

4 ***Automatic Control.*** Sly gives *any degree of automatic control* up to *complete* automatic; minimizing or even removing entirely the human factor.

5 ***Bags More Easily Replaced.*** Although Sly filter bags last a long time, when the bags do need replacing any individual worn bag can be readily replaced without disturbing the others.

•

These dust filters at the American Nepheline Corp. were originally installed to cope with a dust nuisance, but it was soon found that the fine product had a very profitable sales value. Ask for Bulletin 98 and tell us about *your* problem so that we can write you fully.

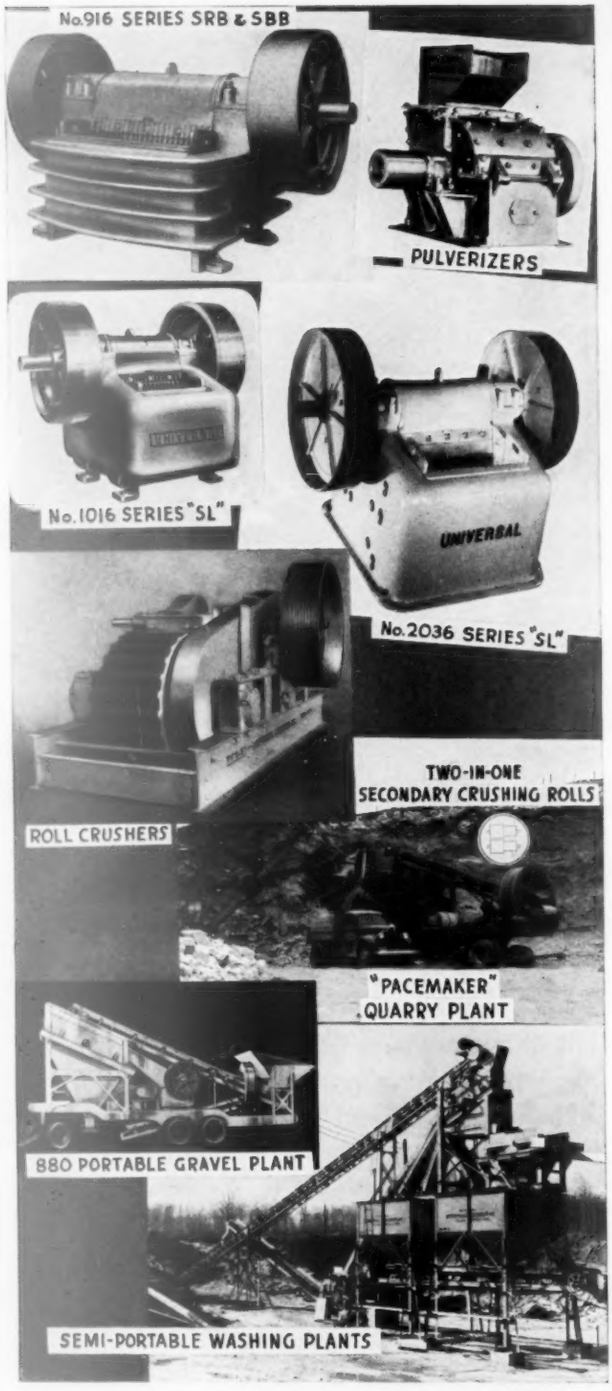
THE W. W. SLY MANUFACTURING CO.

Branch Offices in Principal Cities

4745 Train Ave., Cleveland, Ohio

SLY
INDUSTRIAL DUST CONTROL

These times demand UNIVERSAL
CRUSHING EQUIPMENT



- There's lots of work to be done in a hurry—training camps, defense projects, new roads and road improvements to handle accelerated traffic, housing projects—it's surely no time to use obsolete equipment and make-shift set-ups.

- "Get in and pitch" with Universal profit-proved equipment. It's geared to the times. There's a Universal Crusher, Pulverizer and Stationary or Portable Plant just suited to your needs that will crush your material any size you want it, wherever you are, faster and at lower cost than any other equipment built to do the job.

- Name any equipment in this complete line and we will show you production and operating cost figures that will convince you if you know anything about the stone and gravel business—not just isolated cases, but testimony aplenty from the roll call of Universal customers.

Up-to-the-minute equipment for high production and economical operation is detailed in this 60-page catalog—send for your copy today!

"Don't get caught short." Demands are heavy — plan your purchases now. Universal field engineers and sales-service representatives in most cities will make helpful recommendations.

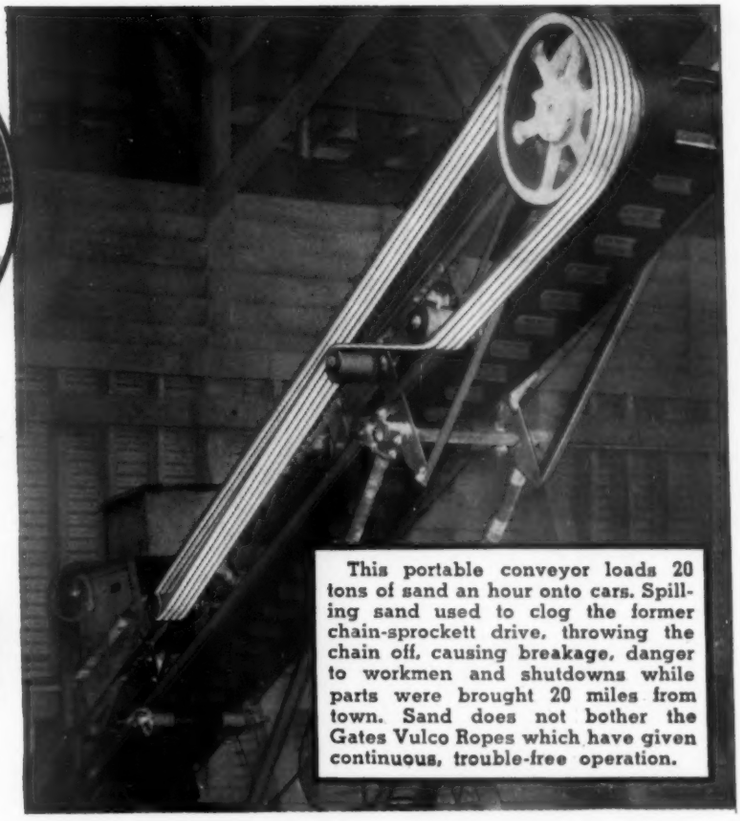
UNIVERSAL CRUSHER COMPANY, 619 C Ave. West, Cedar Rapids, Iowa

UNIVERSAL

CRUSHERS, PULVERIZERS, COMPLETE PLANTS, SPREADEROLLERS, PORTABLE ASPHALT PLANTS

In Two Minutes
This Easy Test

Will Show You
How to



This portable conveyor loads 20 tons of sand an hour onto cars. Spilling sand used to clog the former chain-sprockett drive, throwing the chain off, causing breakage, danger to workmen and shutdowns while parts were brought 20 miles from town. Sand does not bother the Gates Vulco Ropes which have given continuous, trouble-free operation.

SAVE MANY DOLLARS !

What Happens When a V-Belt Bends

FIG. 1

FIG. 2

It's very easy to learn for yourself how a V-belt with a concave side saves your money.

Just take any V-belt and bend it (as illustrated in the photo above). As the belt bends, grip its sidewalls between your finger and thumb. You will feel those sides bulge outward.

If the belt is a straight-sided belt this bulging gives it a shape like that shown in figure 1 (on the left). Clearly this shape does not fit the sheave groove.

But when you bend a belt that is built with the patented Concave side, you find that the sides become perfectly straight—as shown in figure 2. Here are the advantages: This shape exactly fits the sheave groove; this means uniform sidewall wear—longer life for the belt. Also, the full side of the belt is gripping the pulley, which means less slippage—a saving in belt wear and also in power.

The concave side is a Gates patent. Only belts built by Gates are built with the concave side.

THE GATES RUBBER COMPANY

Engineering Offices and Stocks in All Large Industrial Centers

GATES VULCO ROPE DRIVES

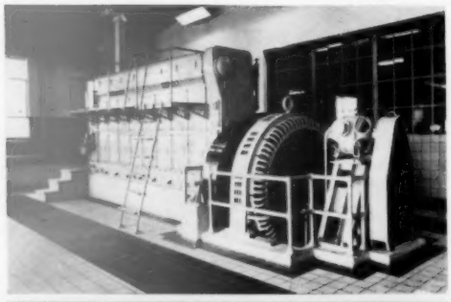
CHICAGO, ILL. 1524 South Western Ave.
HOBOKEN, N. J. Terminal Building
BIRMINGHAM, ALA. 1631 1st Ave., South
LOS ANGELES, CAL. 2240 E. Washington Blvd.
DENVER, COLO. 999 South Broadway
DALLAS, TEX. 2213 Griffin Street
PORTLAND, ORE. 333 N. W. 5th Avenue
SAN FRANCISCO, CAL. 2700 16th Street

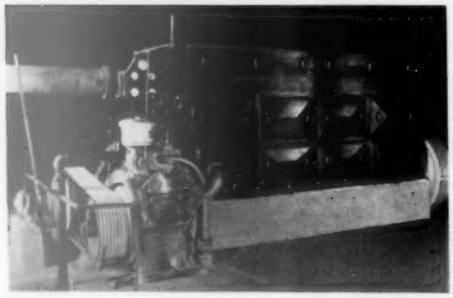
Superior DIESELS

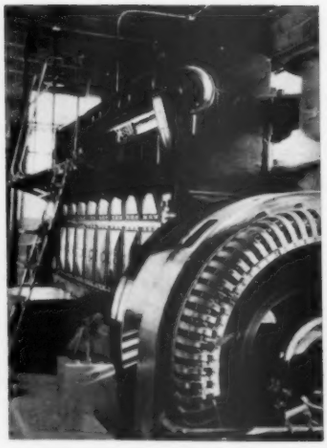
FOR PROVEN RELIABILITY AND ECONOMY

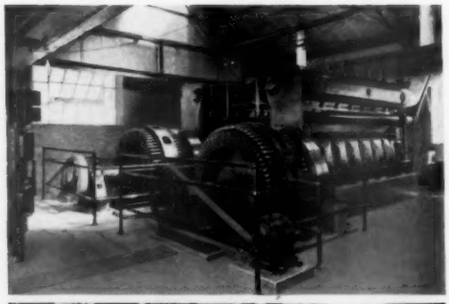
• • • • • in quarries, rock crushing plants, dredges, sand and gravel pits—the hardest kind of a job and the most demanding duty which any engine can be called upon to deliver. Remote locations, long hours, sudden shock loads, frequent overloads, are the rule rather than the exception—but SUPERIORS ARE BUILT FOR EXACTLY THAT KIND OF SERVICE.

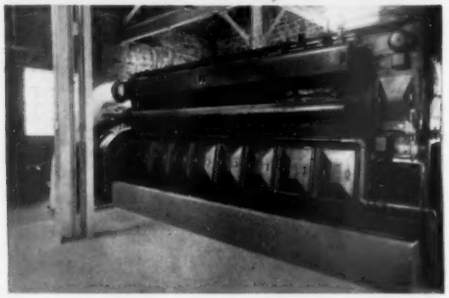
The ever-increasing number of Superior Diesels being installed for this most severe of all services is the best and most convincing argument we know why YOU should have dependable Superior power on YOUR toughest job.











THE NATIONAL SUPPLY COMPANY... SUPERIOR ENGINE DIVISION

SALES OFFICES: Springfield, Ohio; Philadelphia, Penna.; New York, N. Y.; Los Angeles, Cal.; Jacksonville, Fla.; Houston, Texas; St. Louis, Mo.; Fort Worth, Texas; Tulsa, Okla.; Boston, Mass. FACTORIES: Springfield, Ohio; Philadelphia, Penna.

Put Any MARION In Rock

To meet the "rockiest" kind of digging conditions, a power shovel must be built accordingly. The reason a MARION is recognized as a full fledged "rock machine" is because it has definitely been engineered, designed, constructed and powered with this kind of tough service in mind. The same consideration has been given every MARION in the line . . . from ¾ cu. yd. to 35 cu. yds. Let a MARION make short work of your rock digging requirements.

Write for bulletin.

THE MARION STEAM SHOVEL CO.
MARION, OHIO, U. S. A.

Modernize with
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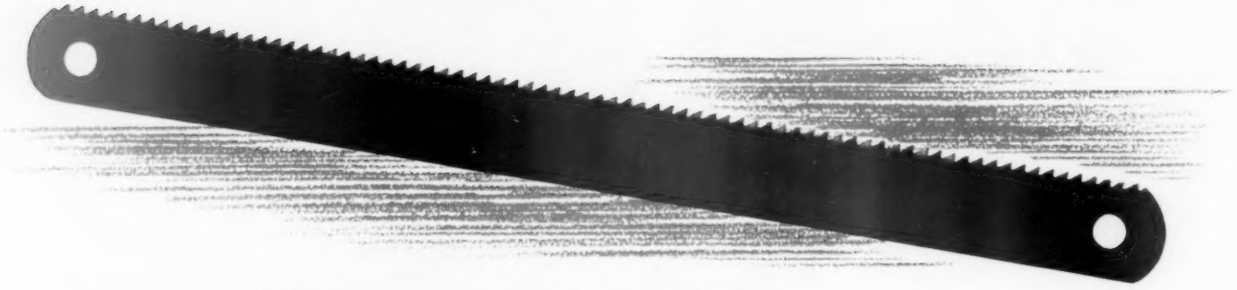
Shovels • Draglines • Cranes
Pull-Shovels • Clamshells
Walkers • from
¾ cu. yd. to 35 cu. yds. Gasoline
Diesel • Electric

In these days—would you buy a hack saw which lasted twice as long?



"Obviously—yes"—you say. "So what?"

Only this—that we are trying to point out you can find the same difference in wire rope that you do in a hack saw.

for Greater SPEED, ECONOMY and SAFETY

HAZARD LAY-SET *Preformed*

● In comparison with non-preformed wire rope Hazard LAY-SET Preformed invariably gives *much* longer and better service. That means fewer machine shutdowns—better production—more efficient operation. In short: Speed—Economy—Safety.

Hazard LAY-SET Wire Ropes will do this because they are preformed. "Preforming" is a mill process which places every wire and strand in a relaxed condition. This elimination of internal stresses within the steel gives LAY-SET extreme resistance to fatigue—and that means longer life. In addition, the preforming process makes LAY-SET resist kinking, handle easier and faster. It eliminates all necessity for seizing the ends, makes it safer for workmen to handle.

For longer rope life, fewer machine shutdowns, increased production, reduced injuries to workmen—specify Hazard LAY-SET Preformed Green Strand. All Hazard ropes identified by the Green Strand are made of Improved Plow Steel.

HAZARD WIRE ROPE DIVISION • WILKES-BARRE, PENNSYLVANIA

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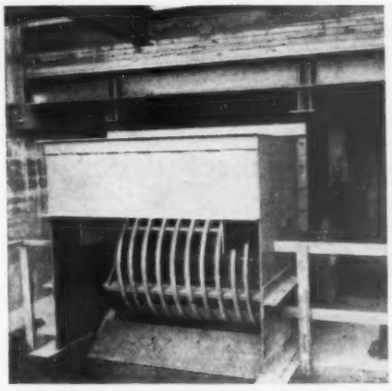
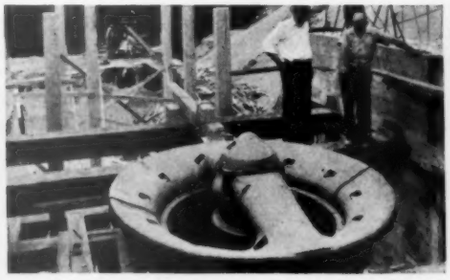
AMERICAN CHAIN & CABLE COMPANY, INC.

District Offices: New York, Chicago, Philadelphia, Pittsburgh, Fort Worth, San Francisco, Denver, Los Angeles, Atlanta, Tacoma

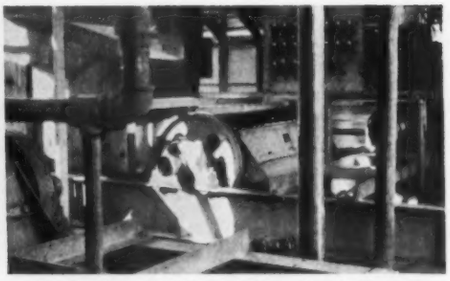
WATER FOR NEW YORK CITY



View of one of plant's two 36" x 6' Telsmith Reciprocating Plate Feeders, and No. 540 Telsmith Rotary Grizzly.



Plus 4" gravel goes to a No. 16-B Telsmith Gyratory Primary Crusher. Minus 4" gravel and sand is by-passed.



One 5'x12' Double Deck and two 5'x12' Telsmith Triple Deck Pulsators act as scalping, preliminary sizing and sand separating screens.

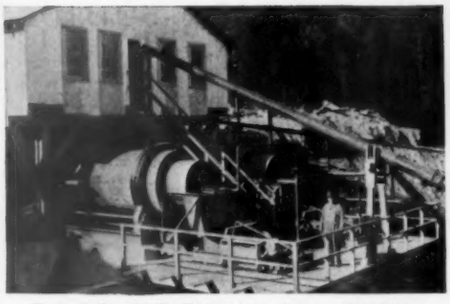
One of the two No. 36 Telsmith Gyrasphere Crushers producing minus 1½" or minus ¾" product as required.

800,000 yds. of aggregate for Delaware Aqueduct

BEING SUPPLIED BY

TELSMITH PLANT

Telsmith Steel Frame Belt Conveyors take finished sand and gravel to steel bins equipped with Telsmith Bin Gates.



Two 72" x 10'6" Telsmith Super-Scrubbers thoroughly clean the gravel, and eliminate any clay or soft stone.

Two 3' x 8' Telsmith Double Deck Screens rinse and size the gravel. The lower 1¼" deck dewaters the gravel.

Processing 800,000 cu. yds. of concrete aggregates for the big Delaware Aqueduct. And meeting the tough specifications of the New York City Board of Water Supply—1½" and ¾" gravel, and minus ¼" sand with no crusher grits. A big job! And it takes a big tonnage plant! The Rossoff Sand & Gravel Corp. has just such a plant near Kerhonkson, N. Y.

In co-operation with Mr. Samuel R. Rossoff and his engineers, this new and completely modern plant was designed by Telsmith. Telsmith built the machinery . . . supervised its installation . . . co-ordinating and balancing every unit. And the plant is turning out its required tonnage every hour. Telsmith sound engineering experience, Telsmith high grade equipment, and Telsmith centralized responsibility, here as in so many other plants, delivered all-around satisfactory results.

Are you about to build a new gravel pit, or quarry plant? Or planning to expand your present plant? Then it most certainly will pay you to find out about Telsmith complete plant service and equipment.

Get Bulletin G-15. **Sent free, on request.** G-8

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Cable Addresses: Sengworks, Milwaukee—Concrete, London

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The compilers of the 1941 Directory Section of Pit and Quarry Handbook have labored painstakingly to build an accurate list of all known American producers of nonmetallic minerals. Each new listing has been carefully scrutinized for accuracy and completeness. Previous listings have been revised, checked, double-checked. All appear two ways—(1) alphabetical by companies, (2) geographical by plants. It gives you company names, officers, location of plants, size or capacity, and names of the men who do the buying. Select the complete Handbook *and* Directory, or the convenient, flexibly-bound Directory alone. Now ready for distribution. Order NOW to insure getting one of the first copies. Use coupon below . . . we'll bill you after you get the book.

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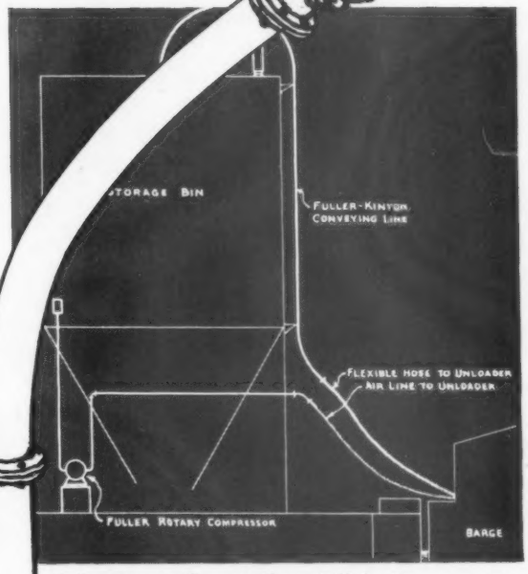
WHEREVER A PIPE LINE CAN BE RUN

OVERHEAD · · · UNDERGROUND

VERTICAL · · · HORIZONTAL

UP AND DOWN HILL

THE FULLER-KINYON SYSTEM



Fuller-Kinyon Remote-Control Unloader recovering and conveying cement from barge to storage. This system in use by a ready-mixed concrete plant in New York City.

Eliminate conventional, straight-line conveying. Place your conveying lines anywhere . . . cut the corners to shorten conveying distance. Layouts of new plants can be simplified; old plants modernized without interfering with existing buildings and equipment.

The system is safe and dustless. Will load, unload, convey and reclaim practically any dry pulverized material at a low cost per ton.

FULLER COMPANY

CATASAUQUA, PENNSYLVANIA

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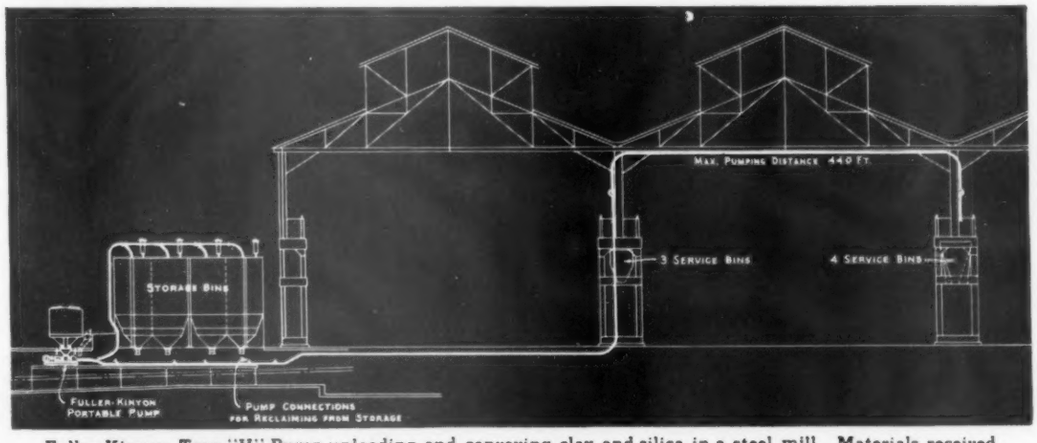
San Francisco: 320-321 Chancery Bldg.



Fuller-Kinyon Type "H" Pump unloading and conveying clay and silica in a steel mill. Materials received in hopper-bottom cars and conveyed to storage. When materials are to be recovered from storage, the pump, mounted on wheels running on a track, is connected to the bin to be emptied and material conveyed to process bins in the plant.

P-49

FULLER-KINYON, FLUXO, AND AIRVEYOR CONVEYING SYSTEMS · · · · ROTARY FEEDERS AND DISCHARGE GATES
ROTARY AIR COMPRESSORS AND VACUUM PUMPS · · · · AIR-QUENCHING COOLERS · · · · BIN SIGNALS

THE MOTOR YOU ASKED FOR IS ➡ *Strong*

New **TRI CLAD** *Motor*

BUILT FOR PROTECTION FIRST...TO LAST

No other standard motor, we believe, has ever met the general-purpose requirements of industry with so well-balanced a combination of performance characteristics, convenience features, and provisions for protection. Integral-hp sizes up to 20 hp (at 3600 rpm), open or splashproof, are now available. Capacitor-motors up to 5 hp (at 3600 rpm) can also be furnished.

Combines 500 man-years of RESEARCH with 62 years of motor EXPERIENCE

on Protection

Extra Protection

AGAINST PHYSICAL DAMAGE

A truly modern motor, you told us, must be able to withstand accidental blows, flying chips, dripping liquids, and occasional bumps in moving or mounting. That's how we built the Tri-Clad motor!

We made the frame and end shields of cast iron; used channel and rib sections to give ample strength where needed, without increasing the weight; cast the feet integrally with the frame to make them sturdy and rigid. We completely enclosed the upper portion and carefully baffled all ventilating openings to protect vital motor parts. We provided the bearings with cast-iron housings and made them dust tight. And the finishing touch —we give the motor a tough coat of paint that protects the metal parts against rust and corrosion.

The Tri-Clad motor is fully protected against the accidental ill-treatment some motors encounter all the time, and which *all* motors encounter some of the time. As a safeguard against production interruptions, as a prime factor in lowering costs, as an extra increment of value on machines you build, you'll find that this new motor means extra profit protection, too.

Be sure your next induction motors are Tri-Clad. General Electric, Schenectady, N. Y.

Extra Protection

AGAINST ELECTRICAL BREAKDOWN

New stator windings of Formex wire give extra protection internally against moisture, oil, abrasion, and heat aging. New synthetic impregnating and protecting varnishes make a rigid unit with a hard finish.

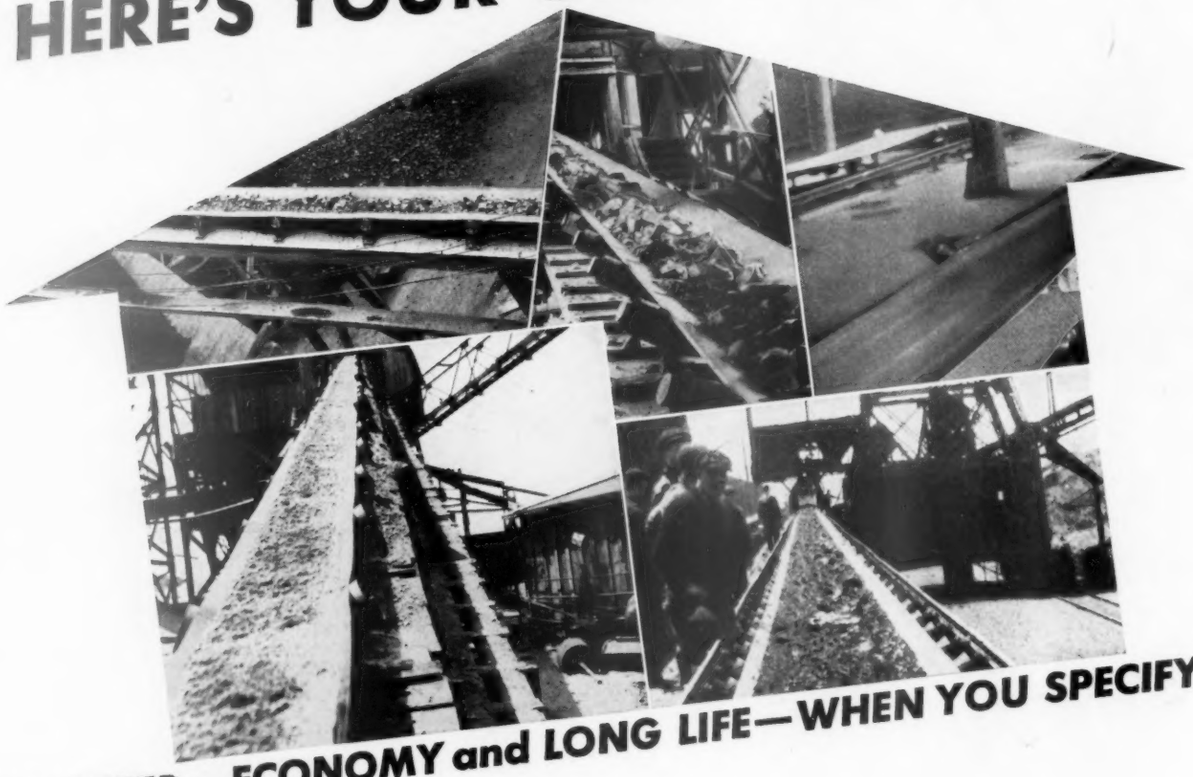
Extra Protection

AGAINST OPERATING WEAR AND TEAR

Sleeve bearings of new design have longer life and greater load capacity. The one-piece, cast-aluminum rotor winding, with fans cast integrally, is practically indestructible.

GENERAL ELECTRIC

WANT EXTRA TONNAGE...
HERE'S YOUR CONVEYOR BELT!



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Progressive QUAKER is better prepared to supply its share of BELTING—HOSE—PACKINGS, which have demonstrated their quality to "take it" under all conditions, many far from ideal, still giving extra long service, because each is the typical results of engineering to fit the needs where they are operating today.

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OVER 50 YEARS CONSISTENT QUALITY

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Vacuum Control Speeds Pit Work!

Buckeye Clippers' 24 features give you rock bottom gravel digging costs and by far the lowest shovel operating and maintenance costs.

	Vacuum Control	Ind. Chain Crowd	175 F.P.M. Min. Hoist Speed	Tubular Dipper Stick	Shatter-Proof Glass	Max. Digging Radius 23'-2"	Max. Dump Height 17'-6"	Safety Power Drum Brakes	Min. 5.25 R.P.M. Swing	2.25 M.P.H. Top Travel Speed	Simultaneous Swing, Hoist, Travel	4 Anti-F. Bearinged Hook Rollers	A.F. Bearings on Main Mchy. Shafts	Min. 16" Crawler Treads	Min. 10'-3½" Crawler Length	Ample Work Space in Cab	Power Boom Hoist and Splitty Brake	Frame Hardened Gears	Automatic Swing Brake	Over 13½" Ground Clearance	Gear Universal Power Hook Up	Vacuum Power Trip	Over 51 H.P. Rating	Weight over 27,000 lbs.
IPPER ODEL 50	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Shovel No. 4	No	Yes	No	No	No	Yes	Yes	No	Yes	No	No	No	Yes	Yes	Yes	No	No	No	No	No	No	No	Yes
Shovel No. 5	No	Yes	No	No	No	Yes	Yes	No	Yes	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No	Yes
Shovel No. 6	No	Yes	Yes	No	No	Yes	Yes	No	Yes	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No	Yes
Shovel No. 7	No	Yes	Yes	Yes	No	Yes	Yes	No	No	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No	Yes
Shovel No. 8	No	Yes	Yes	No	No	No	Yes	No	No	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No	Yes
Shovel No. 9	No	No	Yes	No	No	No	Yes	No	No	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No	Yes
Shovel No. 10	No	No	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No	Yes
Shovel No. 11	No	No	Yes	Yes	No	No	Yes	Yes	No	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No	Yes
Shovel No. 12	No	Yes	Yes	No	No	Yes	Yes	No	No	No	No	No	Yes	Yes	No	No	No	No	No	No	No	No	Yes

MODEL 50 ½ YARD ✓
MODEL 60 ⅝ YARD ✓
MODEL 70 ¾ YARD ✓

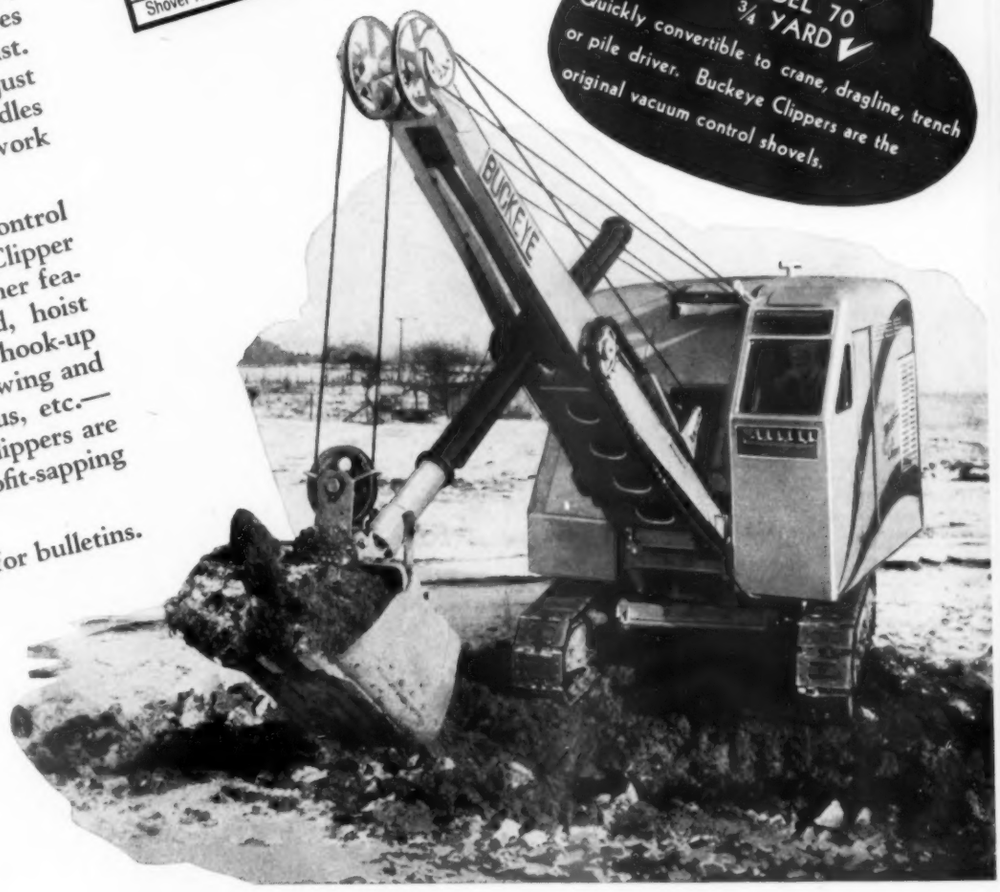
Quickly convertible to crane, dragline, trench or pile driver. Buckeye Clippers are the original vacuum control shovels.

A flick of the handles and the Clipper has started to chew off a big bite while another shovel "would still be thinking about it."

Mevac (the original) vacuum power control, standard equipment on every Clipper, gives you faster, smoother swing, crowd and hoist. No long clumsy levers to shove and tug—just six small handles do the trick. Three handles control all actions through a complete work cycle.

The savings provided by vacuum control would be reason enough to choose a Clipper for your pit. But also check its 23 other features—including simultaneous crowd, hoist and swing; universal joint power hook-up from engine to mainshaft; vacuum swing and drum brakes; greater digging radius, etc.—and you will see why small, fast Clippers are replacing larger, slow speed profit-sapping shovels.

Get the cost-cutting facts—send for bulletins.



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Findlay, Ohio

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Bigger Profits Are "IN THE BUCKET"

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The demand for Dempster-Dumpsters has increased in proportion to the

"ALL-OUT" ORDERS for INDUSTRY

The BUCKETRUX is designed in sizes to meet the requirements of the job.

Quarry Operators—Lime and Cement Plants — realize that efficiency today means results in terms of production.

2½ Cu. Yds.

2 Cu. Yds.

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4 Cu. Yds.

Drop Bottom Bucket in Carrying Position

Furnished in capacities of 4,500 lb. to 12,000 lb.—Pay Loads—for each respective detachable bucket.

Built to Endure — the BUCKETRUX has no equal.

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ALL TYPES OF DETACHABLE BODIES HANDLED WITH STANDARD DUMPSTER HOISTING UNIT

DEMPSTER BROTHERS, Inc. KNOXVILLE, TENNESSEE **U. S. A.**

3 yd.-a-min. Model 75W

HIGH MOBILITY

TO MATCH HIGH CAPACITY AND DIGGING EFFICIENCY

Heavy duty Model 77C—a general service 3 yd.-a-min. creeper machine. Also with pneumatic tires.

Gravel Bank Special "80" with avalanche protection and cobble guard plates. Rated at 3 to 5 yd. in heavy duty digging.

8 yd.-a-min. "135"—the biggest, heaviest (24,400#) fastest Loader made. A money maker with a fleet of big trucks.

5 yd.-a-min. Pneumatic Tired Model 80 with Avalanche protection for use by a prominent New Jersey sand and gravel producer.

BIG 3 and 5 yard Loaders on *pneumatic tires*, ideal for paved or hard ground. For soft-ground traction, matching machines on *creeper treads*, and a still larger 8 yd. model . . . *Digging efficiency* via patented Haiss Feeding Propellers and slow-speed power crowding drive . . . *Low maintenance* via alloy and manganese steel parts and loader-designed transmissions with all gears and clutches enclosed and oil-bath lubricated . . . *Low costs* via sustained high capacity per gallon of fuel—and upkeep at ½c a yard or less. Low first cost and low depreciation . . . SEE THE 1941 LINE.

Catalogs, prices and operating data are yours for the asking.

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GEORGE HAISS MFG. CO., INC.
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Please send me complete information on ☐ 3 yd. ☐ 5 yd. ☐ 8 yd.
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WHEN SAND PRODUCTION IS A PROBLEM

OR DEMAND EXCEEDS SUPPLY

the Symons Impact Crusher may be the solution, just as it has been for a number of producers of sand, or for making the finer sizes of industrial materials which could not be made with ordinary crushing equipment. Desired sizes of properly shaped particles, so essential for use in aggregates, are assured with this crusher. It is also the ideal machine for reshaping and converting material containing objectionable slivers, flats or slabs into a marketable product. Let us send you further particulars on the application of the Symons Impact Crusher.

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CEMENT ROCK

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SYMONS IMPACT CRUSHER

MORE FEET OF HOLE PER SHIFT
EASIER HOLDING
LOWER UP-KEEP COST

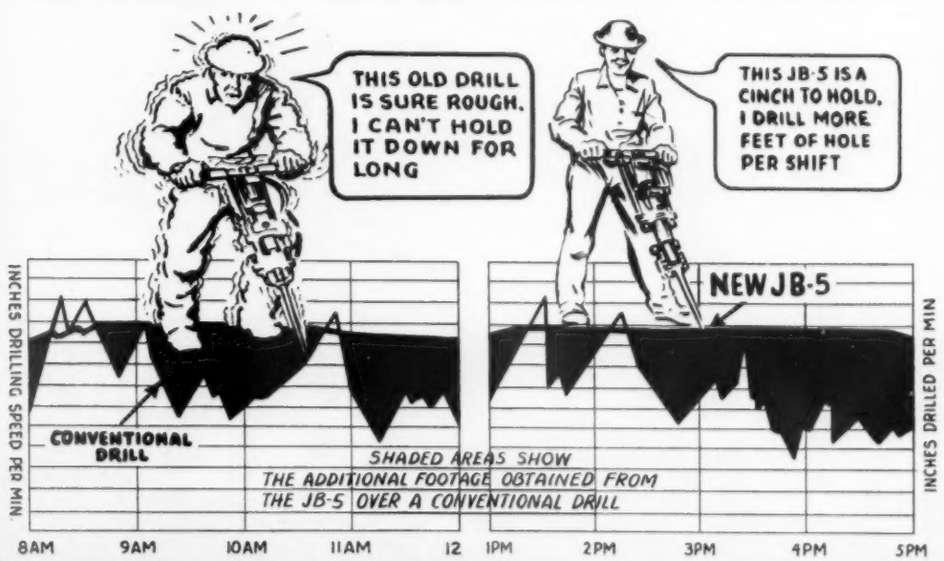
The JB-5

A NEW 55 LB. JACKHAMER

THE Jackhamer is a hand held drill. In operating it, human arms, legs and backs become the mounting—thus a man's size and strength limit the drilling capacity.

In the past, few operators had the strength and endurance needed for top performance of a 55 lb. class hammer throughout the shift. The result was less drilling, excessive fatigue and high upkeep costs.

Today's new Jackhamer, the JB-5 is so designed that the average size man can comfortably handle its full power all day long producing more feet of hole per shift with less upkeep costs. Send for Bulletin No. 2734.



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5-34

Picture of a real Rock Shovel
PAYING EXTRA DIVIDENDS!

Picking up a big one in the J. & L. Snouffer, Inc. Quarry, Dublin, Ohio.

THERE is strength in that front end! Note the huskiness of that boom—the Northwest All Welded Boom—and no Northwest All Welded Boom has ever failed! Note the cap casting at the upper end of the dipper sticks—they are tied together and work as a unit giving the sticks 50% greater resistance to twisting strains.

The independent action of the Northwest Dual Independent Crowd is going to slide that rock into the truck without delay and the dipper will go back up through the bank without stuttering —without the hesitation, the time loss and "second start" digging so often necessary to fill the dipper with the ordinary crowd. That's because the Northwest Dual Crowd utilizes force other shovels waste.

These are just a few of the features of Northwest design that make Northwest a *real* rock shovel —just a few of the advantages that have made Northwest the repeat order machine in the hands of real material movers.

NORTHWEST ENGINEERING COMPANY
1822 Steger Building • 28 East Jackson Boulevard • Chicago, Illinois

NORTHWEST

IF IT'S A REAL ROCK SHOVEL YOU'LL NEVER HAVE TO WORRY ABOUT OUTPUT IN DIRT!

PIT AND QUARRY

Vol. 33 MAY, 1941 No. 11

CONTENTS

News of the Industry 31
Editorial: Defense for War—IV 35
Opens Quarry Near Site of Road Job to Obtain Specification Aggregates 36
Fluorspar Separated by Flotation at New Plant in Illinois-Kentucky Field 39
Looking Inside the Abrasion Machine 43
Lime Operator in Arizona Is Making and Marketing 38 Separate Products 51
New Lime-Putty Plant Approaches the Ideal as Conceived by Its Inventor 54
Legislators Enact Measures Applying to Lime and Aggregates Industries 59
Why Preheaters for Rotary Lime Kilns? 62
Chemical-Lime Specifications 65
Lime Industry Copes with National Defense 69
New Stone Plant Is Almost an Exact Duplicate of One Destroyed by Fire 73
Rebuilds Salt Lake City Plant to Reduce Cost of Production 75
Aggregates for Friant Dam 77
Dravo Dredge Rebuilt to Provide Floating Plant with Hourly Capacity of 250 Tons of Aggregates 83
Aluminous Cement 86
Housing Projects Spell Opportunity for Block Makers, Ready-Mix Firms 107
Special Truck Transports Bulk Cement 109
Adobe Yielding to Concrete as Building Material in Arizona 111

Personal Mention 90
Foreign Practice 92
Occupational Diseases and the Law 92
Traffic News Digest 94
Labor Decision 97
New Machinery and Supplies 101

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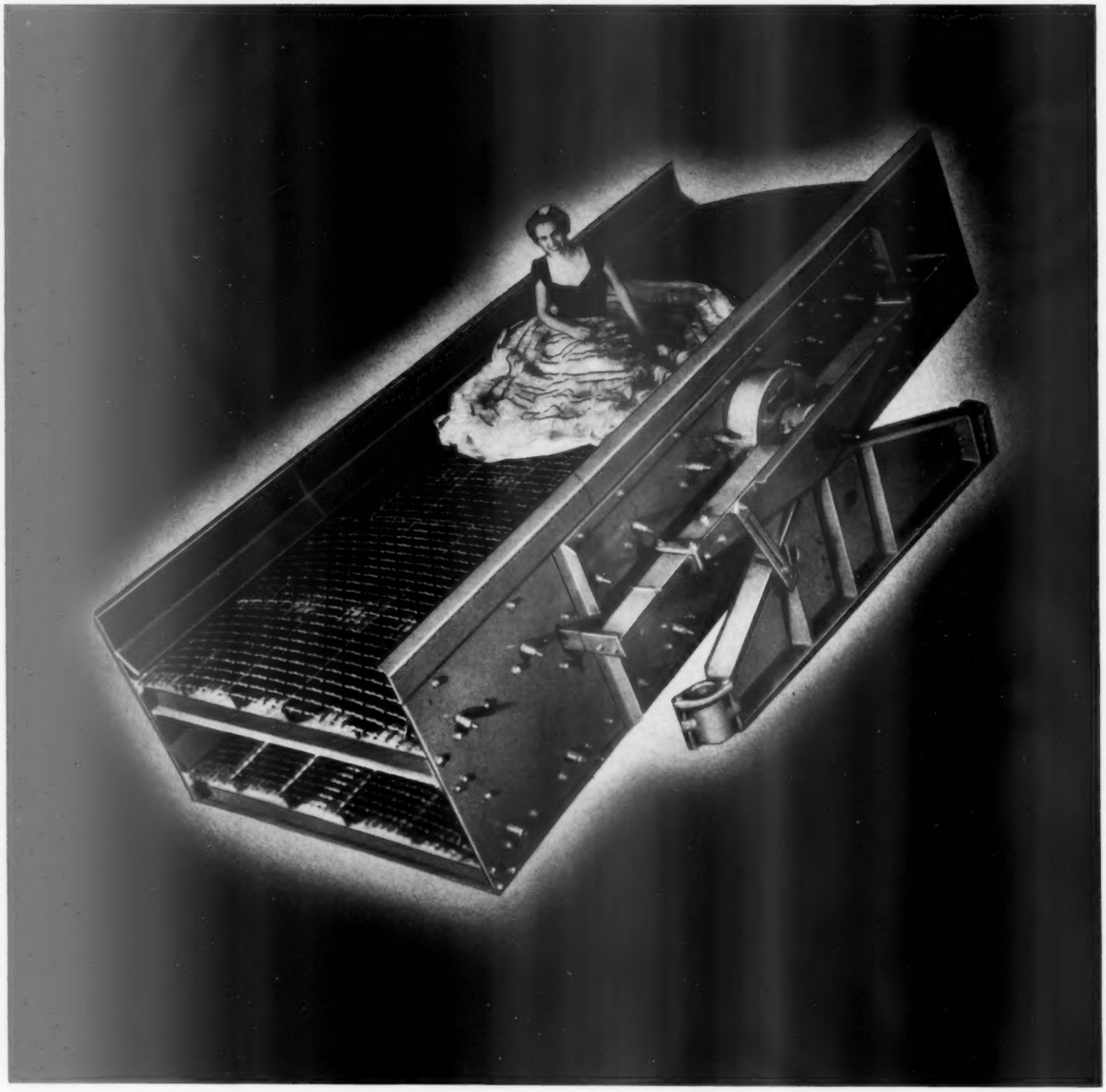

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PIT AND QUARRY

CHICAGO MAY, 1941

New Sales Records in P & Q Field Expected by Bureau of Mines

A continued rise in construction activity in 1941 forecasts further increases in the demand for building materials of mineral origin, a study made by the Bureau of Mines reveals. Sales of mine and quarry products and their derivatives as a class have followed the long-term trend of construction in the past and are benefiting now by the upswing in all types of building.

The large anticipated increase in both public defense construction and private building, according to the Bureau's report, indicates an increased demand for cement and cement products in 1941. As for crushed stone and gravel, sales of which had reached all-time highs in 1939 and 1940, it is likely that the accelerated construction of highways and airport runways in 1941 will establish new sales records for the industry.

The Bureau's study which charts the trends in the shipments of building materials over a period of years and relates them to the trends in construction activity, points out that building materials used extensively in residential construction fared worse during the depression years than other building minerals having a wider variety of uses in the construction field. Although demand for building lime and common face brick has recovered somewhat from the depression, output of these two materials still falls 50 per cent. short of their 1923-25 production. Production of gypsum and roofing slate, on the other hand, has staged a rapid recovery and now stands at over 80 per cent. in comparison to 1923-25 levels, a much better showing than residential building (64 per cent. on the same basis).

More detail regarding the effect of the current expansion in construction activity on building materials sales, together with charts illustrating trends during the past 25 years appear in Bureau of Mines publication I. C. 7157 entitled *Influence of Expanding Construction on Shipments of Building Materials*, which will be published soon.

Southwestern Opens New Stone Quarry

The Southwestern Portland Cement Company is opening up a new quarry some distance from its plant at Victorville, California. Two Mack Diesel trailer-trucks have been purchased to haul the stone about 10 miles to a railroad for transportation to the plant. These huge outfits each have a capacity of about 35 tons of stone and each is mounted on 18 pneumatic-tired wheels.

A Marion electric shovel equipped with a 2½-cubic yard dipper has been purchased for service in the new quarry.

Coming Events

May 7, 1941—Kingston, New York. Meeting, New York State Crushed Stone Association, Governor Clinton Hotel.

May 27-29, 1941—Hot Springs, Virginia. Annual convention, National Lime Association, Homestead Hotel.

June 19-20, 1941—Hot Springs, Virginia. Sixth annual convention, National Industrial Sand Association.

June 25, 1941—Chicago. Semi-annual meeting, board of directors, National Ready Mixed Concrete Association, Palmer House.

June 23-27, 1941—Chicago. Annual meeting, American Society for Testing Materials, Palmer House.

Gravel-Plant Site Being Selected in Panama Canal Zone

Work has been started on the preparation of a large site along the north bank of the Chagres River near Gamboa in the Canal Zone for a new gravel-processing plant which will be accessible by land or water for obtaining aggregates in the construction work on the third set of locks of the Panama Canal.

Approximately 100 acres of land a short distance up-river from the Dredging Division's gravel plant is to be cleared by the Dredging Division forces for the Special Engineering Division. Surveying and mapping of the complete area has been started and will probably be completed by the end of May.

The Section of Surveys will also prepare a topographic map of approximately 130 acres of land, also doing hydrographic work around the site for the gravel plant. Establishment of the aggregates plant will probably be by contract.

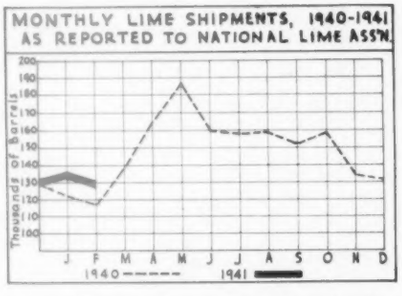
Seek to Retire Deficit of State-Owned Plant

A $670,000 deficit left by the defunct Michigan state-owned cement plant once operated by prison labor near Chelsea, which has stood on the state books for 10 years, may be retired with state highway department funds if the legislature desires, Attorney General Herbert J. Rushton has ruled.

Auditor General Vernon J. Brown said he requested the opinion because several legislators felt the deficit probably could be made a highway department charge since the plant's product had been used to "reduce highway construction costs."

Normally, highway funds may only be used for highway construction and maintenance.

The Portland-cement industry in February, 1941, produced 8,368,000 barrels, shipped 7,472,000 barrels from the mills, and had in stock at the end of the month 25,316,000 barrels, according to the Bureau of Mines. Production and shipments of cement in February, 1941, showed increases of 66.0 and 52.3 per cent., respectively, as compared with February, 1940. Portland-cement stocks at mills were 2.2 per cent. lower than a year ago. These statistics are compiled from reports for February received by the Bureau of Mines from all manufacturing plants except one, for which an estimate has been included in lieu of actual returns.



According to data collected by the National Lime Association, 71 companies in February, 1941, shipped 130,669 tons (89,127 quicklime; 41,542 hydrate). Reporting companies represent 51.2 per cent. of the association's total capacity of record. Based on PIT AND QUARRY'S estimates for the remainder of the industry the total shipments for the month are estimated to have been approximately 255,000 tons. Shipments of lime by use and grade for February, 1941, were:

Use	Quicklime (tons)	Hydrate (tons)
Agricultural	321	3,563
Building	11,885	20,750
Chemical	76,921	17,229
Total	89,127	41,542

Kinzie Named Santa Cruz Superintendent

Robert Kinzie, Jr., has been made superintendent of the Davenport, California plant of the Santa Cruz Portland Cement Company, succeeding the late Joseph J. Riordan. He has been acting superintendent for several months.

Mr. Kinzie is 37 years old and was born in Alaska where his father was a mine superintendent.

To Spend $250,000 on Mineral-Wool Plant

The American Rock Wool Corporation will shortly begin the erection of a $250,000 plant for the production of mineral wool at Red Wing, Minnesota, according to an announcement by James R. Addington, president.

The corporation has other plants at Wabash, Indiana and at South Plainfield, New Jersey.

Specification Change on Road Work Sought

The Carney Company, Mankato, Minnesota, won an important point in its fight for recognition of its natural cement by the Minnesota highway department, when both branches of the state legislature recently approved a resolution authorizing the commissioner of highways to make comprehensive experiments in the use of blended concrete in the laying of permanent trunk highways in the state.

The Carney Company, Minnesota's only producer of natural cement, has been trying for some time to have state highway specifications drawn to call for concrete made from a blend of 15 to 25 per cent. natural and 75 to 85 per cent. Portland cement.

The Universal Atlas Cement Company has been awarded a contract to supply $1,779,840 worth of cement for the Norfork Dam on the North Fork River near Norfork, Arkansas.

Building Contracts Set Record for Any Year Since 1929

March construction contracts, with a dollar volume of $479,903,000 in 37 eastern states, increased 76 per cent. over March, 1940, and was the culmination of the largest first quarter since 1929, according to the F. W. Dodge Corporation. In the first three months of 1941, building and engineering contracts awarded amounted to a total of $1,055,481,000 compared with $668,943,000 in the first quarter of 1940 and $1,252,330 in the first quarter of 1929.

Non-residential building showed an increase of 110 per cent. over the first quarter of 1940, reaching a valuation total of $410,273,000 this year. Residential building, valued at $375,624,000 showed an increase of 37 per cent. Public works and utilities construction, amounting to $269,584,000, showed an increase of 36 per cent.

Public-ownership construction continues to consist predominantly of defense projects for army, navy, and air force. Deficiencies in housing facilities for enlisted personnel and industrial workers are being met simultaneously by governmental agencies and by private builders, assisted or unassisted by government aid. In the first quarter of 1941, the fact that 84 per cent. of residential building and 59 per cent. of the dollar valuation of all building and engineering contracts awarded were for private ownership indicates that private capital is flowing into construction in increased volume.

American Aggregates to Supply Gravel for Dam

The American Aggregates Corporation will dredge and process nearly 1,000,000 tons of sand and gravel, obtained from the bed of the Little Tennessee River, for constructing the Ft. Loudoun Dam.

The work will be carried out through the summer and fall. The site of the dam is near Lenoir City, Tennessee.

Medusa Converts Plant to Paint Manufacture

A large-scale expansion and improvement program to cost approximately $250,000 is under way at the plant of the Medusa Portland Cement Company near York, Pennsylvania.

The new work will convert an old coal-processing plant into a paint and related products manufactory. New direct-firing units will be installed on the rotary kilns.

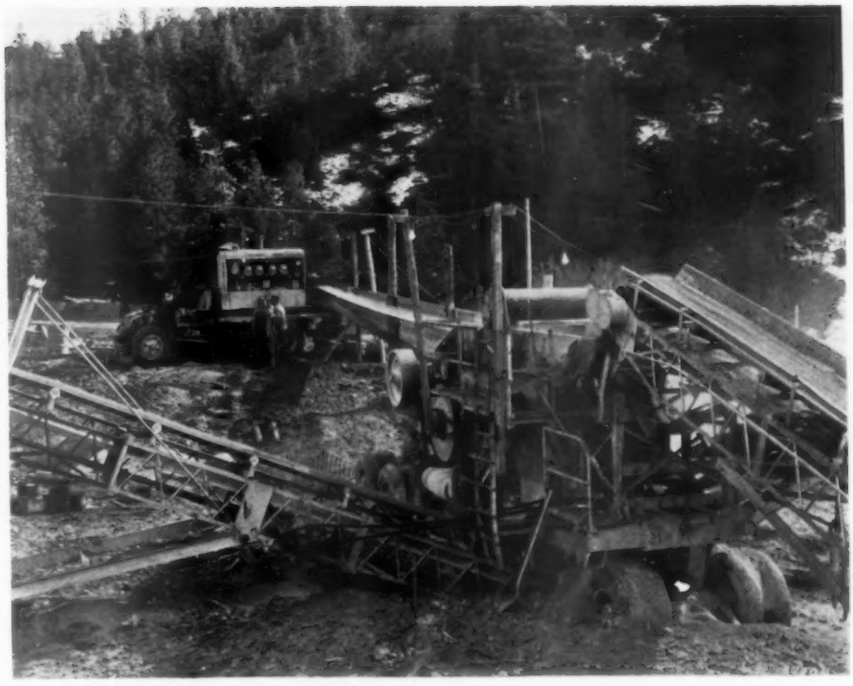
Car-Loadings Gain of 10 to 20% Seen for Second Quarter

Freight-car loadings of gravel, sand and stone in the second quarter of the current year are expected to increase about 20.8 per cent. above actual loadings in the corresponding 1940 quarter, according to estimates compiled by the thirteen regional Shippers' Advisory Boards.

On the basis of those estimates, car loadings of gravel, sand and stone will total 384,752 in the second quarter of 1941, compared with 318,502 in the same period last year.

An increase of 10.5 per cent. in loadings of cement is forecast during the same period, rising from 59,894 during the second quarter of 1940 to an anticipated 76,160 this year.

Lime and plaster car-loadings are expected to increase 10.7 per cent.—from 43,103 in the second quarter of 1940 to 47,721 in the same period this year.



Portable aggregates plant in operation near Mescalero, New Mexico. Owned and operated by Henry Thygesen & Company of Albuquerque, this Cedar Rapids plant is powered by a Caterpillar D17000 Diesel engine which has been operating 14 hours a day on six gallons of 7½-cent fuel per hour.

Asphalt Plant Razed by $40,000 Blaze

A spectacular fire ravaged the aggregate-bituminizing plant of the Barton Sand & Gravel Company at Patuxent, Maryland, four miles from Fort Meade, recently. The damage was estimated at $40,000.

An hour after the blaze was discovered a 2,500-gallon bitumen tank exploded spraying blazing tar about the property and forcing firemen of four companies to retreat.

The fire spread to another tank of equal size, a 1,000-gallon bitumen tank and a 2,000-gallon tank of fuel oil. All were destroyed.

Lime, Cement Plants Order Recuperators

Vanderwerp recuperators are under construction at the Manitowoc Engineering Works for the Standard Lime & Stone Company, La Grange, Illinois; Valley Dolomite Company, St. Louis; and the Peerless Cement Corporation, Port Huron, Michigan. One of the units was also shipped recently to the Philippine Islands for installation on one of the kilns of the Cebu Portland Cement Company.

The Commercial Sand & Gravel Supply Company has established headquarters in the Pearce Building, Salem, Oregon, under the management of J. F. Ulrich.

Launches First of 3 All-Steel Barges

The first of three new all-steel barges scheduled to go into use this year has been launched by the Oil City Sand & Gravel Company, Oil City, Pennsylvania for service on the Allegheny River.

New screening and storage facilities are also being installed.

Glens Falls Puts New Tractors in Service

Four Chevrolet tractor-trailers, each with a carrying capacity of ten tons, have been purchased by the Glens Falls Portland Cement Company for transporting stone from the quarry to the crusher house at the cement plant at Glens Falls, New York.

Locomotives and cars were formerly used to haul the stone.

Changes Firm Name to "Basic Refractories"

Stockholders of Basic Dolomite, Inc., of Cleveland have voted to change the name of the concern to Basic Refractories, Inc.

The company operates plants at Bettsville and Maple Grove in Ohio and has been acquiring deposits of magnesia in Nevada for future development.

To Supply Stone for Ordnance Project

The Ralph Rogers Construction Company of Bloomington, Indiana has been awarded a contract to supply crushed stone for the Burns City naval powder-storage plant near that city.

A separate crushing plant will be set up to fill the contract. Mr. Rogers will sublet the hauling to a commercial trucking concern.

Awards Contract for New Gypsum Plant

The Pacific Portland Cement Company has awarded a contract to Wells P. Goodenough of Palo Alto, California for the construction of a new unit at its Redwood City plant. The contract price was reported to be $56,543.

Gypsum lath and wallboard will be produced in the new structure the company has revealed.

Completes Installation of Turbo-Generator

The Petoskey Portland Cement Company has just completed the installation of a new Allis-Chalmers 3,500-kilowatt turbo-generator in the power plant of its cement plant at Petoskey, Michigan.

The improvements are costing the company in the neighborhood of $125,000, it is reported.

CURRENT BUSINESS INDICATORS

Spurred by the steadily swelling volume of defense spending, industrial production rose to a new all-time peak in March. On a seasonally-adjusted basis the Federal Reserve Board's composite index of production in manufacturing and mining for the month stood at 143, a gain of 2 points over February and an increase of more than a fourth over the corresponding month of last year. Demand continued unabated during the first half of April, but labor disturbances in the bituminous-coal and automobile industries checked the expansion of industrial output.

With minor exceptions all branches of industry contributed to the advance that took place in March. As in February, however, an important share of the rise was accounted for by the durable-goods industries, particularly those producing machinery, aircraft, ships, and armament. Steel works and rolling mills, for example, operated at virtually 100 per cent. of capacity throughout the month. Automobile production was also unusually high for this season of the year.

Despite the moderate drop in the seasonally-adjusted index of construction contracts, moreover, Dun & Bradstreet reports that the actual dollar value of building permits issued during March was, with two exceptions, at the highest level reached in more than a decade. The exceptions were January and July, 1937.

In contrast with the usual trend freight-car loadings also increased during the month. Against an index of 86 for February the seasonally-adjusted index for March was 87, approximately a fourth higher than in the corresponding period of last year and nearly a third above that for 1939. The present indications are that 1941 will be the most profitable year for the railroads since 1930 and the volume of freight handled is likely to approach the pre-depression level of 1929.

Shipments of Portland cement also show an impressive gain, rising 34 per cent. above the level of the preceding months and 30 per cent. above that for March, 1940. The immediate outlook for cement as well as aggregates is distinctly encouraging, despite the strong possibility that construction for non-defense purposes may feel the pinch of priorities in the relatively-near future.

Other noteworthy gains were registered in the shoe and textile industries. Chemical and rubber production likewise increased and a substantial rise was reported in copper deliveries.

Prices, meanwhile, continued to edge upward. From an average of 80.6 in February the Bureau of Labor Statistics' index of wholesale prices rose to 81.5 in March, the most pronounced increase that has taken place since the outbreak of the war abroad. Moreover, the more sensitive index of basic commodity prices moved upward at a disturbing rate, reaching a new post-war high of 137.4 on April 10. Prospects of runaway prices on a scale comparable with the 1917-20 period, however, have been lessened by the establishment of the Office of Price Administration and Civilian Supply. This new agency, headed by Leon Henderson, is equipped with virtually all the price-fixing authority of the old War Industries Board.

The extent to which the defense program is responsible for the current upsurge of business is suggested by a report that has just been prepared by the Bureau of Research and Statistics, Office of Production Management. According to this source defense contracts awarded by the Army and Navy from June 1, 1940, to March 31, 1941, have totaled $13,022,000,000.

Navy awards for ships and ship parts constitute somewhat more than a third of the total contracts ($4,500,000,000). Particularly significant, however, is the fact that awards for industrial facilities account for approximately a tenth of the total and 7.2 per cent. has gone for the construction of posts, depots, and stations.

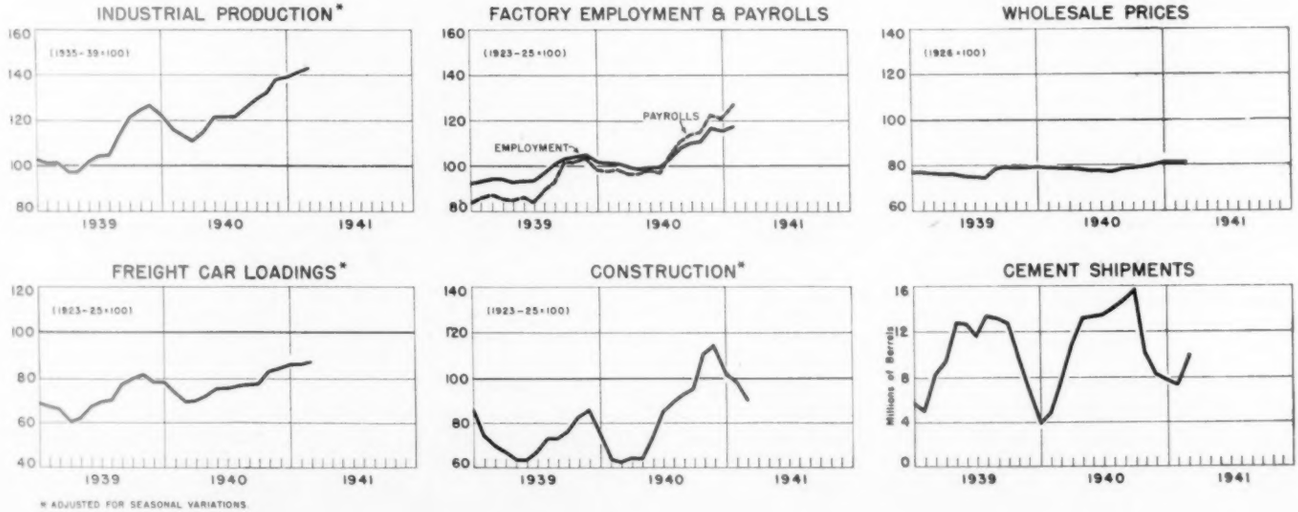
National Gypsum to Erect New Offices

A decorative three-story building of stone, steel and concrete will be erected in Buffalo this summer to house the general offices of the National Gypsum Company.

The building, having a 125-foot width and 100-foot depth, will house about twice as many employees as at present. Latest refinements in air and light conditioning and sound control will be combined in the design.

Although established only fifteen years ago, National Gypsum to-day has assets in excess of $21,000,000. During the last eight years it has absorbed ten other companies. Its products include, besides gypsum plaster, wallboards, metal lath, paint, insulation board, rock wool and sound-control material.

The concern has acquired in the last six months the General Insulating & Manufacturing Company of St. Louis and the Chemical Lime Company of Bellefonte, Pennsylvania. Mr. Baker explained that whenever a new concern is acquired the policy is to move the consolidated company's headquarters staff into the home office. To-day more than 250 individuals are employed in the Buffalo office here.



EDITORIAL

Defense for War—IV

IN the early days of Hitler's struggle for power he won the support of large capitalists by convincing them that democracy was the forerunner of Bolshevism and that the surest—in fact, the only—way to prevent the coming of that black beast was to be found in the principles of National Socialism. His claims were based on the theory that pure individualism and absolute freedom are irreconcilable, that the world must choose between absolutism on the one hand and anarchy on the other. It was not difficult to picture the terrors of Bolshevism—a system that is synonymous with anarchy in the minds of many people—and the establishment of the Weimar Republic seemed to open the way for the inrush of the communistic horde. As contrasted with the destruction which such a change would entail, the burdens of absolutism, as seen in National Socialism, appeared to be the lesser of two evils. That the Hitler *régime* would mean the death of capitalism very few could foresee.

Yet among us, who loudly proclaim the virtues of democracy, there are too many people whose fears are diverted from the real danger to the bogey man, from fascism and its partner, Naziism (National Socialism), to communism. We are told that the democracy which we have professed but indifferently practiced is incompatible with the maintenance of capitalism, that extension of the rights and security of the common man threatens the privileges and vested interests of those who own and control property, that the spread of the doctrine of equality has no other end than the setting up of collectivism.

It is difficult for some persons to understand that the attainment of freedom, whether it be political. religious, or economic, involves the relinquishment of some rights, the loss of some freedom. A society in which every person is free to do as he wishes, regardless of the effects of his acts on the same freedom possessed and exercised by others, is not a society. It is anarchy, chaos, a situation in which pure individualism stifles the possibility of any advance in the common welfare, for there is, under such conditions, no place for any such concept as the common welfare. Where everyone thinks and acts only with the view of his own personal advantage and aggrandizement, no one gives a thought to the good that may come to anyone else. The only alternative to such disorder, Hitler would have us believe, is his "new world order," in other words, a world-wide absolutism with him, or some equally fanatical successor, sitting at the top, while the millions of ordinary men—including, too, those who at the moment are counted as capitalists—scurry about in antlike bustle, doing his bidding, catering to his whims, flattering his conceit.

One of our most important duties in the defense of this commonwealth against the war now being waged against free peoples everywhere is the demonstration that democracy is a practical working method of reconciling the conflicting aims of pure individualism and absolute freedom. Ours is the job of making a synthesis between the conflicting claims of the individual and society, of personality and collectivity, of freedom and equality. We must show that there is more than a Hobson's choice between the destruction of personality involved in extreme socialization and the confusion that results from the unrestricted exercise of individual inclination. We may recognize the fact that man is a social being without making him the abject slave of some allegedly-superior will. We may, also, grant to every man a large share of freedom without making a shambles of the world.

To make democracy work in America, to make it a reality, is, it seems to us, a task fully as important as the building of the mechanical instruments of war. There may be little or no gain if, while beating off a physical enemy with physical implements, we admit a psychic enemy because of inadequate intellectual defense. While the physical enemy is not yet upon us, the psychic attack has been going on for years. The extent to which that attack has made progress is clearly shown by the still large number of people who, failing to see the implications of their acts and preachments, continue to advocate the adoption of a spirit of physical and moral detachment that accomplishes the very "softening up" process that has uniformly preceded the physical enslavement of peoples in other lands.

We would be despondent of the future of humanity if we could be brought to believe that we must choose between the two extremes that the advocates of fascism and communism set up for us. We believe that there is at least one other political and economic possibility open to us: a democracy—socialized, if you like—that recognizes the social nature of man and that, in attempting to achieve the largest measure of happiness for all, admits the necessity of imposing some definition and limitation on freedom and the individual. Under the other two choices widely discussed we see great danger to human culture, to human happiness, to human comfort. We see no possibility of making available human creative ability in its broadest aspects under a system that represses individual expression and the development of individual personality and that places shackles on individual initiative. Nor do we see anything more hopeful or useful in a situation that gives the individual unrestricted rights to trample upon, exploit, hurt or destroy his contemporaries. If one tyrant can be dangerous, a billion tyrants can be much more so.

CAPITALISTS and their satellites, the capitalist-aping middle class, have not only much, but everything, to fear from both extremes. National Socialism is the counterpart of Bolshevism. Beginning as a right-wing movement, it has acquired more and more the characteristics of a left-wing movement. Its expropriation of the Jews is, it begins to be clear, but a first step toward the expropriation of property owners generally. In attempting to steer a straight course we should remember that neither the left wing nor the right one is sufficient in itself; the intellect that lies between is the force that prevails and guides.

Our choice of action does not lie between the domination of the jungle-like individualist and the tyranny of the egomaniac. We can still have the control of the intellect, the power to analyze our problems and to develop rational solutions, to recognize the ability and limitations of man and to harmonize them in a working political and economic synthesis which we call democracy.

Opens Quarry Near Site of Road Job to Obtain Specification Aggregates

A FEW years ago Robert E. Tompkins, a highway contractor, of Rochester, New York, was awarded a contract for the construction of a $78,000 reinforced-concrete overpass at Davenport Center, New York. When he was about to order his crushed stone, he first queried the New York State Department of Public Works, Department of Highways, and learned, to his amazement, that there was no departmentally-approved stone quarried locally. So he had to have stone shipped in by railway from the nearest approved source, giving the New York Central Railroad, across whose tracks the overpass was being built, an unduly large share of the profit he should have made from the job.

Just about the time the overpass was nearing completion "a little bird" told Mr. Tompkins that the Department of Highways was contemplating the reconstruction and relocation of 9 miles of highway, running east from the new overpass. The new highway was to be

By SPENCER JONES

of reinforced-concrete construction, and an educated guess would be that it would cost between $400,000 and $500,000, since it would involve the laying of nearly 25,000 cubic yards of reinforced-concrete pavement, plus cuts, fills, culverts and bridges.

Mr. Tompkins decided he would go after that contract when, if, and as it was advertised. But unless he could do something about the stone situation, he would not be any better off than any other contractor so far as being the low bidder was concerned.

Then followed days and weeks and months of prospecting for rock—the kind of rock that the Department of Public Works would approve and its specifications are strict. Mr. Tompkins explored the hills for miles around, looking for outcrops, collecting samples, estimating available yardages and making tests.

Did he find the kind of rock he was looking for? He did! And where was it? High up in a hillside pasture just one mile from the new overpass he was building in Davenport Center! All he got out of his more distant prospecting was a lot of healthy exercise.

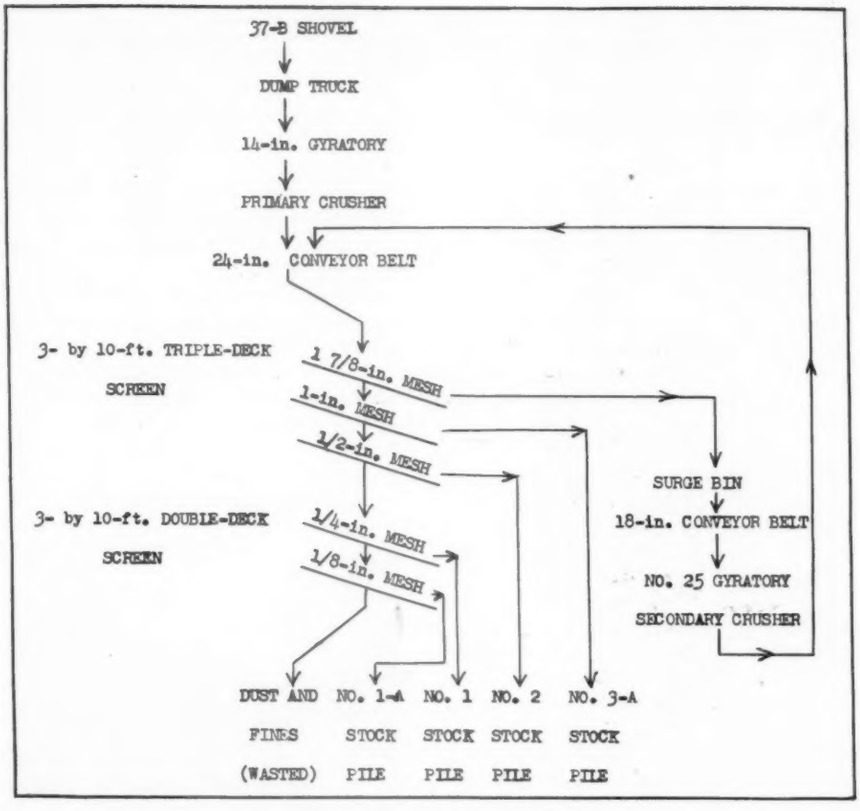
The rock was a blue sandstone, weighing 166 pounds per cubic foot, and with a specific gravity of 2.66. Its crushing strength, shearing strength, modulus of rupture and modulus of elasticity were satisfactory to the Department of Public Works and the rock was approved.

Mr. Tompkins then purchased 33 acres of the pasture land, including access to a public highway, and became the proprietor of an embryo quarry and crushing plant. He had no prior experience in the business, but he had plenty of ideas, backed by a Civil Engineering degree from the University of Rochester and 16 years of building and highway contracting.

Attempting to open a quarry was, he knew, a gamble, but he reasoned that even if he did not get the prospective 9 miles of new highway construction, the successful bidder would at least buy the stone from him. And if he did get the contract to build the highway he was perfectly content to be his own best customer while the quarry was becoming established. Besides, after the 9 miles of road east of Davenport Center was finished, there was 8 more miles of the same road to be built some time soon between Davenport Center and

Crushing-and-screening plant at the Tompkins quarry.

A view in the quarry. Dust-control unit at the left.



Flow-sheet of the Tompkins operations.

Oneonta, and he intended to furnish the stone, whether or not he mixed it into the concrete on a highway-construction job. However, he *did* get the 9 miles of new road to build, which helped considerably.

Visits to and studies of other quarries and crushing plants soon convinced Mr. Tompkins that he would be wise to purchase sturdy equipment, as much of it of the same make as possible, and to service it properly. In addition, he decided to establish standards of inspection and maintenance that would always keep this equipment in practically perfect working order. Repairs would be made in normally idle time *before* something broke.

For blast-hole drilling he bought an Ingersoll-Rand FM-2 pneumatic-tired wagon-drill and two jackhammers, an Ingersoll-Rand and a Cleveland. A 2-stage, air-cooled Ingersoll-Rand 315-c.f.m. air-compressor, powered with a Waukesha gasoline engine, was selected, and a No. 2-A Kadco dust-control unit purchased to comply with the New York State laws for dry drilling.

Having used Bucyrus-Erie excavating machinery exclusively for many years, his order for a 1½-cubic yard shovel of that make with a Caterpillar Diesel motor was a natural thing to do, although a couple of the ways in which he uses the shovel are uncommon in quarry operation.

Kennedy-Van Saun got a blanket order for the complete crushing plant. Mr. Tompkins figured that if there was any trouble between the primary crusher and the stock-piles he was going to know exactly whom to hold responsible.

Way up on the side-hill pasture he leveled off a little patch of ground, poured some concrete foundations, and installed a 2-cycle, 2-cylinder Cooper-Bessemer horizontal Diesel engine and a 440-volt, 60-cycle, 3-phase General Electric generator to handle the 75-kilowatt load of the crushing plant. For the first few months of operation this engine-room was well-ventilated, but suitable housing has probably been provided long ere now because the winters in Davenport Center are long and cold, and Willis Richards, the engineer, is no Eskimo.

Superintendent William Gardner and "Tex" Brown, powderman.

Instead of using a bulldozer to remove the 2 to 4 feet of earth overburden (which is, incidentally, well supplied with tree stumps), Tompkins sends his 37-B Bucyrus-Erie shovel up to the top of the cliff and loads the earth, stumps and small bowlders into a 9-cubic yard 6-38-DUR Linn gasoline-powered dump truck which hauls the material away to a spoil bank. By using this method he is not practically forced to shove the overburden over the quarry face and down to the quarry floor, where it must be removed. The shovel and dump truck, both having crawler treads, are able to climb the steep grades with ease and do a thorough job of overburden removal without the need of re-handling.

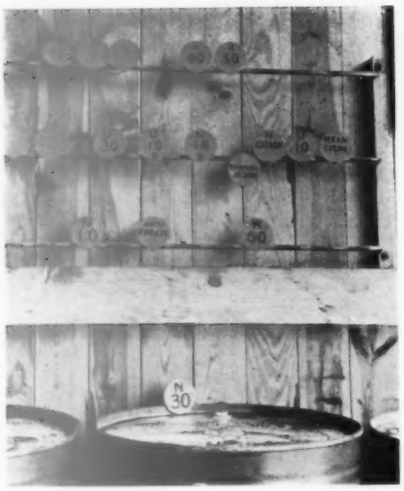
The Diesel-engine installation which has since been inclosed.

The quarry is worked in benches of about 18-foot height, since only the Ingersoll-Rand wagon-drill is used for making vertical blast-holes. The present need for only 60 tons production per hour, average, and the limited capacity of the primary crusher make the use of a well-drill on a single, high quarry face inadvisable.

Blast-holes are started at 2⅞-inch diameter and are drilled about 18 feet deep, the bottom diameter of the holes being 2 inches. Ingersoll-Rand detachable bits are used, and make approximately 50 feet of hole before re-sharpening is needed. Tompkins has been sending the bits away for sharpening, but expects to buy a bit sharpener in the near future (and probably has done so by now). The wagon-drill bits are discarded after 5 or 6 re-sharpenings.

One foot per minute is the average drilling speed of the wagon-drill at the 90-pound pressure of the Ingersoll-Rand compressor. The Kadco dust-control unit makes the dust conspicuous by its absence.

Although Mr. Tompkins has two jackhammers at the quarry, using ⅞-



How the oil drums are marked. Spare disks above.

inch Timken detachable bits (which are discarded after they have made 50 to 60 feet of hole), there is little work for them except occasional snakeholing, which is done to a distance of 8 to 12 feet. Secondary blasting is seldom needed.

The vertical blast-holes, staggered on 3⅓-foot centers and 3½ feet back from the quarry face, are loaded with 5 sticks of 2-inch diameter 60-per cent. Austin Powder Company gelatin resting on the bottom, a No. 6 Austin waterproof blasting cap being inserted in the bottom stick. Then 2 feet of rock-dust stemming follows, on top of which 5 sticks of 1¾-inch diameter 40-per cent. Austin gelatin are placed. Another 2 feet of stemming and then the final load of 3 sticks of 1¾-inch diameter 40-per cent. Austin gelatin. The stemming extends from the top of these 3 sticks up to the surface of the ground.

One hundred holes are fired at a time, hooked up in two units of 50 holes each, wired in parallel and the two units fired in series with a 100-hole du Pont blasting battery. According to Mr. Tompkins' figures, about ½ pound of explosive brings down 1 cubic yard of rock, which weighs 4,500 pounds per cubic yard in the solid and about 2,400 pounds per cubic yard loose.

Instead of mud-capping chunks of rock that are too big to go through the shovel dipper or into the primary crusher, Mr. Tompkins makes little ones out of big ones by dropping a 2,400-pound, pear-shaped skull-cracker on them. The skull-cracker has two lugs cast integrally in the small end, with a 2-inch hole cored through each. A wire-rope sling, laid between the lugs, is held in place by means of a 1¾-inch bolt passing above it through the holes in the lugs. A cotter key through the small end of the bolt keeps it from falling out of the holes.

The wire-rope sling is looped over one of the dipper teeth of the 37-B Bucyrus-Erie shovel; the dipper is raised as high as possible, hoisting the skull-cracker over the rock to be broken. Then the dipper is allowed to drop swiftly so that the skull-cracker lands on the rock. But just as the skull-cracker hits the rock the operator steps on the brake suddenly to keep the dipper from dropping any further, thus preventing the wire sling from jumping off the dipper tooth. It is an interesting technique to watch, but the practice is not particularly beneficial to clutches, brakes or ropes.

The blasted rock is loaded by the shovel into the Linn truck and hauled about 150 yards to the crusher plant. The 14-inch Kennedy-Van Saun primary gyratory crusher seems a little small, but delays at this point are not so frequent as to have any material effect on the comparatively light production schedule. A flow-sheet, herewith, gives the types and sizes of conveyors and screens.

No stock bins are used, and a Haiss portable loader with crawler treads supplies the trucks that haul the crushed stone away. Commercial sales to contractors, builders, county and municipal highway construction and maintenance departments, etc., are slowly mounting.

Despite the fact that Mr. Tompkins has purchased what he believes to be sturdy and efficient equipment, he has his master mechanic, Ralph Barrows, keep a watchful eye on each piece of machinery. Every couple of days all the moving parts are carefully inspected and repairs or adjustments are made, as a matter of policy, before a break-down occurs.

A completely-equipped machine, blacksmith and welding shop is maintained in the hamlet of Davenport Center, serving the roadbuilding equipment as well as the quarry.

One piece of repair equipment of which Mr. Tompkins is particularly

The fuel, oil, battery, tire, and motor servicing truck.

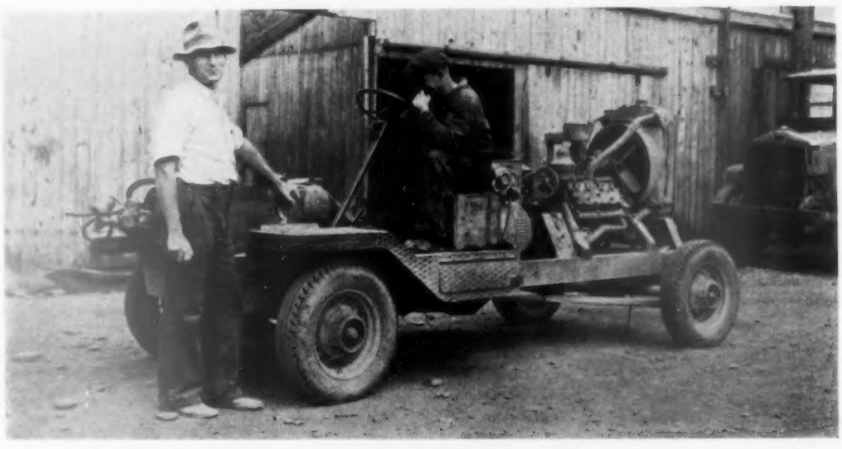
proud, because of results produced, is an ingenious and practical portable electric-welding outfit. This consists of a Model No. WR-300-S Hobart welding generator, producing 300 amperes at 40 volts, or 12 kilowatts, with a current range from 50 to 400 amperes, providing hundreds of combinations of voltage and welding current. The generator is mounted on the chassis of a Ford V-8 and is direct-connected to the V-8 engine, which has been removed from its original position over the front wheels and mounted a little ahead of the rear axle, the radiator facing the rear.

The original electric storage-battery and the starting motor-generator of the V-8 have been retained to start the gasoline engine, and for ignition. A heavy duty 50-60-volt electric motor, operated by current from the welding generator, is clutch-connected to the front end of the V-8's gear-box to take the place of the V-8's gasoline engine.

The rest of the space formerly occupied by the engine is decked over with a diamond-check steel platform, used as a welding bench and for carrying tools and gas-welding tanks. For night work there is a 1,500-candlepower floodlight.

The V-8 engine drives the Hobart generator; the generator furnishes the electricity to drive the electric motor; the motor turns the drive-shaft and

(Continued on page 74)



Robert E. Tompkins (standing) and Ralph Barrows, master mechanic with the portable welding outfit.

Fluorspar Separated by Flotation at New Plant in Illinois-Kentucky Field

ONE of the nonmetallic minerals of vital importance to the defense program is fluorspar, which is used chiefly as a flux in open-hearth steel furnaces. Some of the spar is used in the manufacture of hydrofluoric acid and comparatively small quantities in the glass and ceramic industries, in the manufacture of lenses and in metallurgical processes. About 80 per cent. of the entire output of fluorspar in the Western Hemisphere comes from the Illinois-Kentucky field centering around Rosiclare, Illinois, and Marion, Kentucky. This field in 1939 produced 164,820 tons of fluorspar valued at about $3,300,000. This year mines and plants are operating three shifts daily and an even higher output is expected.

Several new plants have been built recently in this and other areas to meet the growing demand for this vital product. One of these new plants is operated at Rosiclare, Illinois, by the Mahoning Mining Company, a subsidiary of the Youngstown Sheet & Tube Company, which was assigned the job of locating a source of fluorspar supply for the company's use. Lands near Cave in Rock, Illinois, were leased and prospected by drilling, and important ore deposits were discovered. The development of a mine was begun and it was soon found that zinc and lead were present in large quantities, raising a difficult separation problem. The U. S. Bureau of Mines coöperated in developing a method of separation by flotation at its Rolla, Missouri, station.

After a successful flow-sheet was developed late in 1938 a concentrating plant was erected at Rosiclare. The new plant went into operation in July, 1939 but for several months operated only on local fluorspar tailing piles in order to obtain experience in the commercial-scale production of fluorspar alone. The processing of the complex ore from the company's own mine began in November, 1939. As the ore has to be ground to a fineness of 96 per cent. through 150-mesh in order to free all values a pelleting method had to be developed to make the coarse spar required by the steel company.

Although the flow sheet was developed in coöperation with the Bureau of Mines the plant was designed by the company with the advice of the Denver Equipment Company and the other makers of equipment involved. Froth-flotation methods are used throughout.

By W. E. TRAUFFER

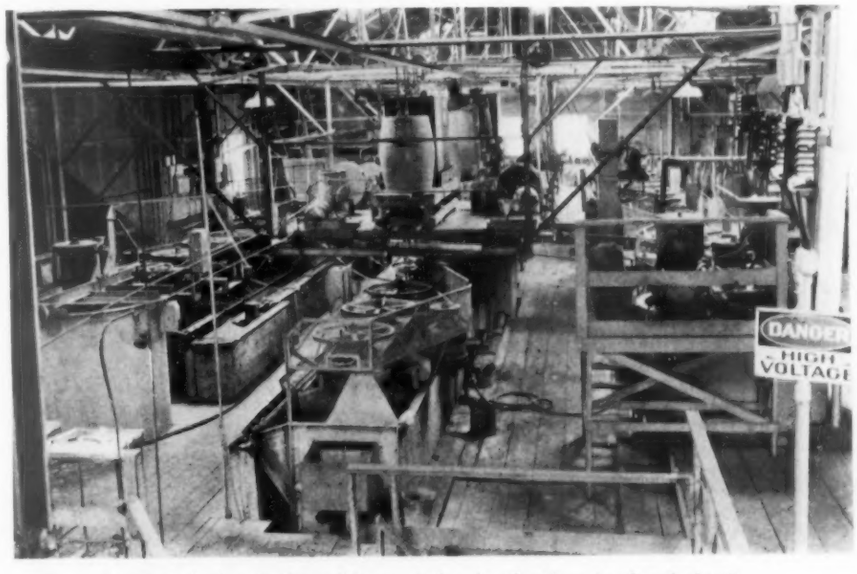
A view of the crushing plant and flotation buildings.

The input of raw ore varies from 7 to 10 tons per hour for three 8-hour shifts, 5 or 6 days per week, making a total weekly input of about 1,100 tons. The weekly production at present amounts to approximately 400 tons of acid-grade fluorspar, 70 tons of metallurgical-grade fluorspar, 150 to 200 tons of zinc sulphide and 50 tons of lead sulphite. The crushing plant and mine are producing about 25 tons per hour and are operated only one 8-hour shift daily.

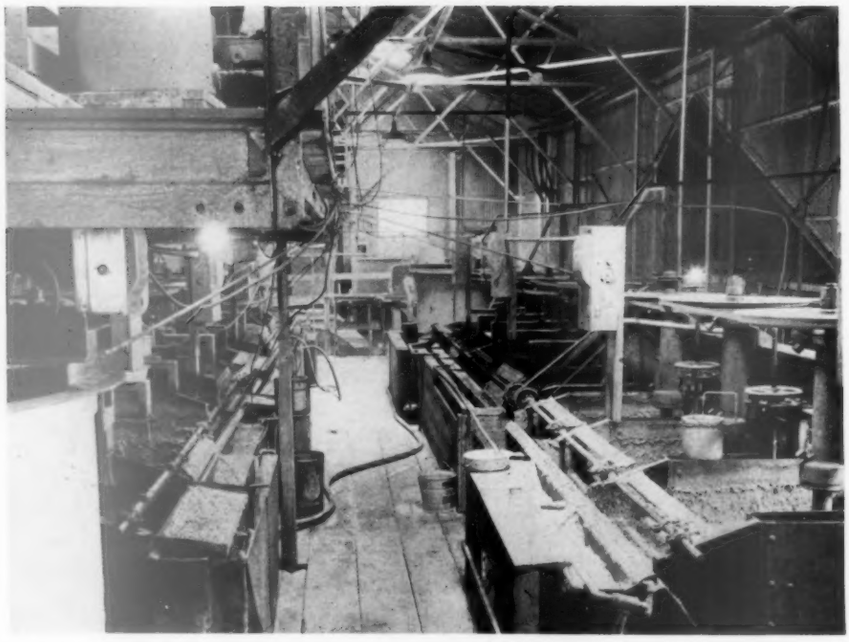
The deposits controlled by the company are of the replacement type and are mainly in blanket form. The deposit now being operated is 12 feet thick and is 300 feet below the surface of the ground. Another deposit has been developed but is not now being worked because its zinc content is only 3 to 4 per cent. and the production of zinc is also important to the defense program. This blanket is at a depth of 160 feet.

The mine in use is being worked through a vertical shaft and there is also a ventilation shaft. The room-and-pillar method is being used. Drilling is done with air drills using Ingersoll-Rand detachable bits. Illinois Powder Company 30-per cent. gelatin explosive is used.

The crude ore is loaded with hand shovels into 1,200-pound circular cans



A general view in the cell-house with rake classifiers in closed circuit.



Another view in the cell-house. Zinc cells at left and background, lead cells in foreground.

or buckets on cars. These are hauled to the working shaft in trains of 6 or 8 by a Whitcomb electric-battery locomotive. The loaded cans are hoisted up the shaft one at a time and the ore is dumped into a 200-ton bin. A fleet of six 6-ton Ford dump trucks is used to haul the ore 18 miles to the plant.

The natural draft through the two shafts ventilates most of the mine but forced draft is used in some of the more remote sections. There are no gases, dangerous or otherwise, in these mines. As in most of the other fluorspar mines, there is considerable water seepage, the mine-drainage pumps recovering about 200 gallons of water per minute. Air for drilling and other purposes is supplied by an 880-c.f.m. Ingersoll-Rand 2-stage compressor driven by a 120-horsepower Fairbanks-Morse Diesel.

Density controller connected to the ball-mill.

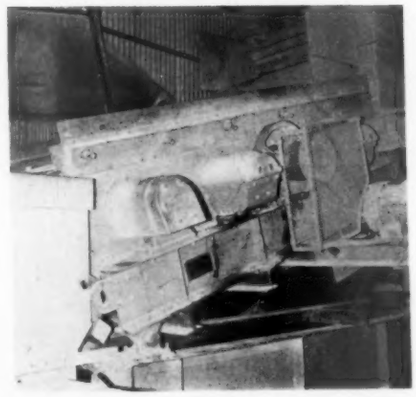
At the plant the ore is discharged from the trucks into a 70-ton receiving bin. A Stephens-Adamson apron-feeder discharges the ore on a 24-inch by 50-foot belt-conveyor from which it is discharged into a 24- by 24-inch Rogers jaw crusher. A 24-inch by 30-foot belt-conveyor carries the ore to a bucket-elevator from which it is discharged on a 5- by 10-foot Tyler Ty-Rock 2-deck screen. Only the top deck

Dried briquets of spar being discharged from traveling-grate drier to elevator.

of this screen is now being used. The plus ½-inch oversize material from this screen is carried on a 30-foot belt-conveyor to a Symons 3-foot short-head cone crusher, whose product is discharged on the belt-conveyor ahead of the screen. A Dings magnet over the conveyor ahead of the crusher removes any tramp iron that may be present in the ore.

The minus ½-inch ore passing through the screen is discharged into a 200-ton circular steel bin. A second bin of the same capacity can be used in case a different type of ore from another mine is to be processed. A short belt-conveyor feeds from the screen to this bin. Under each bin is a vane feeder driven through a Stephens-Adamson variable-speed reducer. A Syntron electric vibrator attached to the conical bottom of each bin prevents material from sticking in it. The ore is discharged from the bins on a 47-foot belt-conveyor running to a bucket-elevator which discharges it into a 3-ton feed hopper. A Hardinge constant-weight feeder supplies the ore at any desired rate to the ball-mill.

The feed to the mill is automatically controlled. In the feed hopper is a Stephens-Adamson Televel indicator. As the level of ore in the hopper reaches the indicator it switches an electric current to a bi-metal (steel-and-copper) heating strip which heats up in about a minute before it breaks contact and shuts off the vane feeder. As the ore level then drops below the indicator the current in the strip is cut off and in



Double-deck screen which scalps oversize to cone crusher.

another minute the contact which starts the vane feeder is made. This system was developed to meet the particular needs at this plant.

The Mine & Smelter Equipment Company 8- by 6-foot Marcy ball-mill is equipped with a grate discharge. Part of the water required is added at the feed end of the mill in proportion to the rate of mill feed. The product of the mill goes to a 6- by 24-foot 8-inch Dorr Duplex heavy-duty rake classifier equipped with a Mine & Smelter density controller. This device controls the rate of water feed at the ball-mill discharge so that the slurry going to the classifier has a constant density.

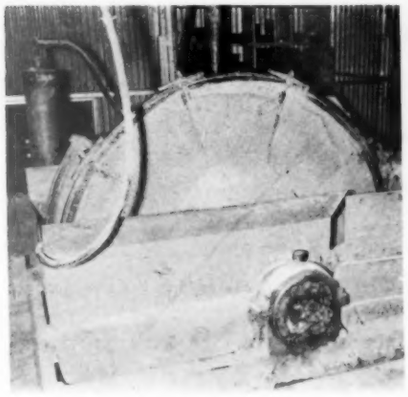
The coarse sand product of the classifier is returned to the mill. The classifier overflow, all minus 100-mesh, is fed by a 2-inch Wilfley pump to a 7- by 7-foot Denver load conditioner. Reagents are added at the ball-mill and a frother is added to the conditioner over-

The drum filter and feed pump ahead of the rotary drier.

flow. The pulp is then fed to the second in a row of six Denver 38- by 38-inch "Sub-A" lead flotation machines or cells. In these cells the froth is lead and the pulp is fluorspar and zinc. The pulp progresses, decreasing in value, through the cells. The froth travels in the opposite direction, ending at cell No. 1 as lead concentrate. This concentrate goes to a 6-foot diameter Oliver leaf filter. The resulting filter cake contains, an average, about 62 per cent. lead, 7 per cent. zinc and 1 to 2 per cent. CaF_2 (fluorspar). The cake is discharged into a bin from which it is loaded into railway cars for shipment.

The tailings from these cells go to a 30- by 8-foot thickener. The agitator arm of this thickener is equipped with a Dagley ratchet-type overload device on its drive sprocket to prevent damage in case of a blocking-up. A Denver 6-inch Simplex diaphragm pump with a variable-stroke adjustable while in operation, transfers the thickener product to the feed box of a 2-inch Wilfley pump. This material is fed into a 7- by 7-foot Denver zinc conditioner, where reagents are added.

The conditioner overflow goes to the fifth cell of a row of twelve 38- by 38-inch Denver "Sub-A" zinc flotation cells. The froth from cells No. 5 and 6 goes to cell No. 4 and the froth from this cell is split with half going to lead-cleaner cells 3, 2 and 1 and the other half to the third of three new lead-

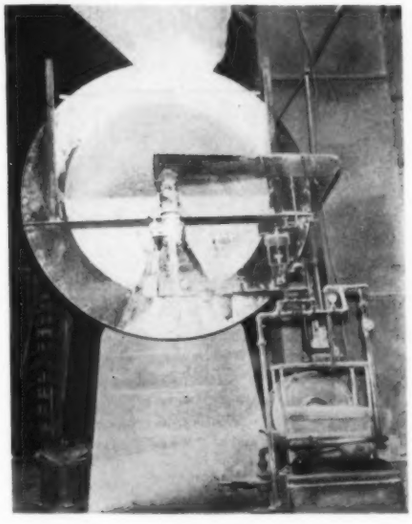


The 6-foot double-disk filter.

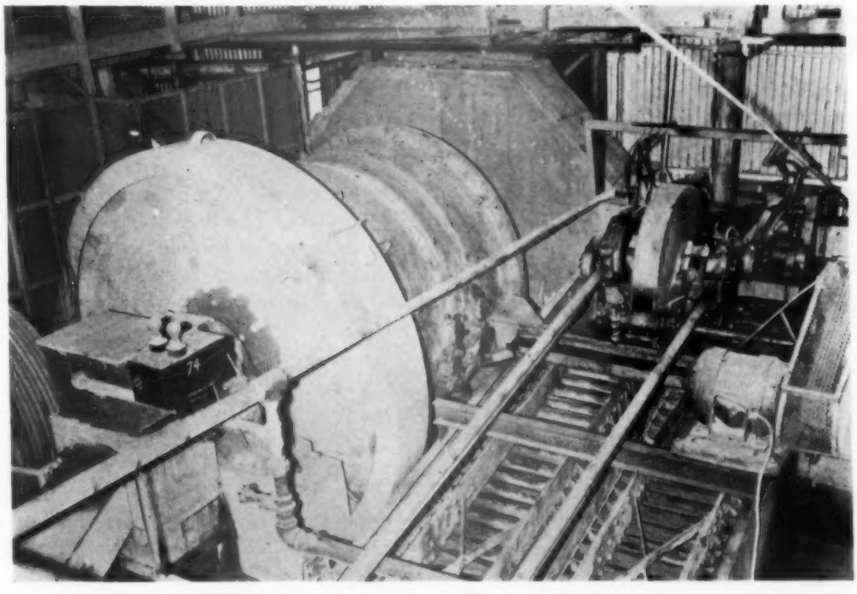
cleaner cells, 3c, 2c and 1c. The froth from cell 3c progresses to cell 1c and the pulp from all these cells is fed back to cell 4. The froth from cell 3 progresses to cell 1. The pulp from these three cells also goes to cell 4 and all the pulp is fed from cell 4 to 7 and then progresses to cell 12.

The froth (zinc concentrate) from cells 1 and 1c is transferred by a 2-inch Wilfley pump to a 6-foot diameter American 2-disk filter which is equipped with U. S. Rubber Company "Multipore" porous-rubber filter sections. The filter cake contains an average of 63.3 per cent. metallic zinc, 0.6 per cent. lead and 0.6 per cent. fluorspar. The remainder is mostly sulphur chemically combined with zinc. The actual zinc-sulphide content averages about 95 per cent. A shuttle conveyor feeds this material to a Stephens-Adamson Sinden box-car loader.

The pulp or zinc tailings from cell No. 12 goes to a 26- by 12-foot Denver thickener. A 4-inch Denver Duplex diaphragm pump feeds the thickener product to a 2-inch Wilfley pump which in turn feeds it to a 7- by 7-foot Denver conditioner where reagents are added. The overflow goes to the first of a row of fifteen 38- by 38-inch Denver "Sub-A" fluorspar flotation machines. The first three cells are of the double-spitz *(-spitzkasten)* type which discharge froth on both sides.



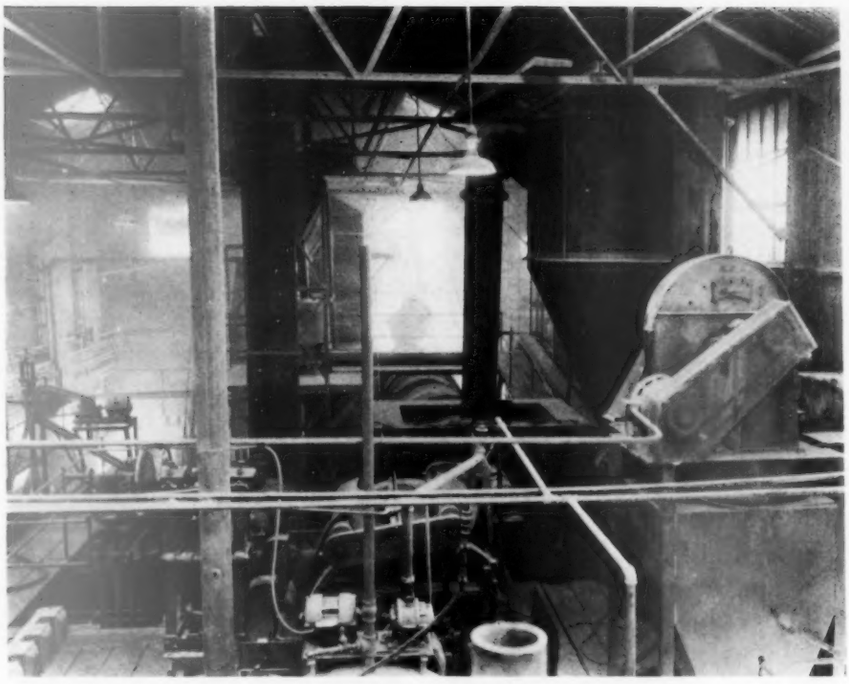
Firing end of rotary drier with oil-burner and blower in foreground.



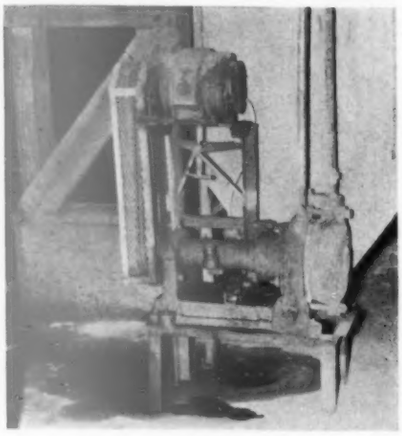
The 5- by 6-foot ball-mill and rake classifier.

The pulp progresses as far as cell 7 and the final tailings drop to a 2-inch Wilfley pump which moves it ½ mile through a 4-inch line to a waste pond. The pipe-line is down grade for most of its length. This waste material forms about 30 per cent. of the original raw-ore feed or about 300 tons weekly.

The froth from cell 7 progresses back to cell 3 and that from cells 1, 2 and 3 is fed by a bucket-elevator to cell 11. From cell 11 the froth goes back to cell 8, that from cells 12 and 13 goes back to cell 9, that from cell 10 goes to cell 8, and most of that from cells 14 and 15 goes to cell 13. The froth for making metallic-grade spar is taken from cell 14 and this controls the quantity of middlings or pulp from the cleaver cells. A 2-inch Wilfley pump transfers the metallic-grade froth to its drier circuit.



Dust-collector connected to the drier. One of the filters and drier are seen in the background.



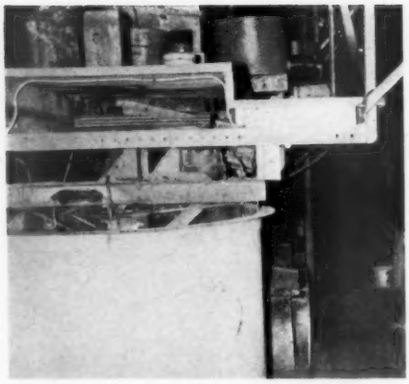
One of the pumps with overhead drive used in the flotation department.

The froth for acid-grade spar has a CaF_2 content of 98.5 per cent. and is fed from cells 8 and 9 by a 2-inch Wilfley pump to a 12-foot Butchart thickener. A 2-inch Denver Simplex diaphragm pump with adjustable stroke feeds the thickener product to a Swenson 4- by 3-foot drum-type filter. The filter cake is fed by a screw-conveyor to the Hardinge Ruggles-Coles 40-foot rotary drier which has an interior diameter of 4 feet. The drier is fired through an 8-foot-long fire-box by a Hauck fuel-oil burner.

The product of the drier is discharged to a screw-conveyor followed by a bucket-elevator. A revolving screen removes lumps and a screw-conveyor discharges this material into any of a row of six sampling bins. Screw-conveyors and a 5-inch Stephens-Adamson Redler conveyor feed either direct into cars or into two 1,000-ton circular steel tanks. The same Redler conveyor is used to load this material into cars.

The gases and dust from the drier are drawn through a smoke-box from which the settled dust is withdrawn by a 3-inch Redler conveyor which feeds it to a screw-conveyor in the loading system mentioned. The gas and dust passing through the smoke-box go through a 6-foot Hardinge cyclone from which the dust is discharged through a star valve to the same screw-conveyor. The gas and dust passing through the cyclone go into the American Air Filter Company wet Rotoclone, which also provides the suction for this system. The gas is exhausted to the atmosphere and the collected sludge goes back to the thickener ahead of the filter.

The froth for metallic-grade spar has a 90-per cent. CaF_2 content and is pumped to a 12-foot thickener from which it is then transferred by a Butchart Simplex pump to a 4- by 2-foot Swenson drum filter. Metal screens are used on these filters. The filter cake drops into a surge bin from which a 5-inch Redler conveyor feeds it to a measuring bin over a J. H. Day Company horizontal mixer where a binding agent is added. This addition reduces the CaF_2 content to 88 per cent. The mixed material is discharged into a hopper. A Stephens-Adamson variable-speed feeder discharges the material to a 5-inch Redler conveyor which feeds either of two briquette-forming machines. One of these machines is of the extrusion type and the other consists of two rolls, one of which is grooved.



A view showing one of the conditioners.

An oscillating conveyor spreads the briquettes over the traveling screen of a Proctor & Schwartz grate-type drier, which has four drying sections and a cooling section. The dried briquettes are discharged to a Webster bucket-elevator followed by a belt-conveyor. A shuttle belt-conveyor loads this material direct into containers on gondola cars or covered hopper cars or feeds a Sinden box-car loader.

All the plant buildings are pre-fabricated steel structures which can be built or enlarged rapidly. They were supplied by the Broden Steel Company. All the buildings are inclosed with Youngstown corrugated galvanized-metal siding and roofing which has a zinc coating of over 2 ounces. The Denver Equipment Company supplied the flotation machines and much of the other equipment. Republic conveyor-belting is used throughout and Gates V-belt drives and Allis-Chalmers motors predominate. The plant is equipped in all departments with Modine electric-heaters.

The water used in this plant comes from a large fluorspar mine in the vicinity. It is treated in an Automatic Pump & Softener Corporation water-softener before it is used. No water is used again.

All the plant's operations are controlled by a very complete laboratory which the company maintains. Without it and the various control checks used it would be impossible to manufacture from this complex ore the three distinct products to meet the very rigid and close specifications which are in effect.

There is also a complete flotation pilot test plant which includes miniature classifiers, a mill, flotation cells, elevators, screw-conveyors, etc. Most of this laboratory-size equipment was supplied by the manufacturers who made the full-size equipment. This miniature plant is used chiefly to try new flow-sheets and to test various reagents and ores.

LOOKING INSIDE THE ABRASION MACHINE

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OF all the so-called quality tests for aggregates, the abrasion test has enjoyed the longest life. The Deval abrasion test has been in use for approximately sixty years and much attention has been given it by testing engineers and other interested persons. More recently the rapid increase in the use of the Los Angeles abrasion test has raised some questions as to the fundamentals involved.

Difficulties have arisen regarding the evaluation of aggregate sizes not covered in the present sample gradings "A" and "B", the establishment of proper acceptance limits for mineral aggregates in various uses, and the coördination of present test values with previously determined results by the standard or the modified Deval abrasion-test procedures or with the results from practical use of the materials.

Since material producers and purchasers are both vitally interested in the test results and quality specifications, it seemed worthwhile to "look inside" the present abrasion-test methods and apparatus, especially the Los Angeles machine, for enlightenment.

It does not seem advisable to dwell upon the historical development of the abrasion-test apparatus and methods in the present paper. This has been done quite adequately by McKesson,[1] Woolf and Runner,[2] and Shelburne,[3] so that the reader may be referred to them.

It is the purpose of this paper to present the results of four coördinated investigations, namely,

I.—The analysis of the Los Angeles abrasion-test apparatus as a *work machine.*

II.—The study of test results with aggregates whose composition and characteristics are known to be uniform, with special emphasis on the *effect of surface area of the original samples* upon the test results in the Los Angeles abrasion machine.

III.—The effect of surface area of the original samples upon the results obtained with the *modified Deval abrasion test.*

IV.—A comparison of *railroad ballast* with highway aggregate sizes from the same sources in the Los Angeles abrasion test.

Just a brief description of the Los Angeles abrasion machine is pertinent, before examining the test methods and results obtained therewith. It consists of a hollow steel cylinder, closed at both ends, having an inside diameter of 28 inches and an inside length of 20 inches. The cylinder is mounted on stub shafts so that it may be rotated in a horizontal position. An opening is provided for the introduction of the sample and charge and this is closed with a dust-tight removable cover bolted in place.

A removable steel shelf projects 3½ inches radially into the cylinder and extends its full length.

The abrasive charge consists of cast-iron spheres 1⅞ inches in diameter and each weighing between 390 and 445 grams. The charge of 12 balls, weighing 5,000 grams ± 25 grams, is used for grading "A", while 11 balls, weighing 4,583 ± 25 grams, are used with grading "B."

The test sample consists of 5,000 grams of clean dry aggregate of one of the following grades.

Square Openings		
Passing	Retained on	
1½-inch	1-inch	
1-inch	¾-inch	
¾-inch	½-inch	
½-inch	⅜-inch	
Grading A (Weight in grams)	Grading B (Weight in grams)	
1,250	0	
1,250	0	
1,250	2,500	
1,250	2,500	

After the sample and the abrasive charge are placed in the abrasion machine the apparatus is rotated for 500 revolutions at a speed of 30 to 33 r.p.m. The material is then removed from the machine and sieved on a No. 12 (1,680-micron) sieve. The material retained on the sieve is washed, dried and weighed to the nearest gram. The difference between the original and the final weights, expressed as a percentage of the original weight, is reported as the percentage of wear.

Investigation I: Analysis of Los Angeles Abrasion Machine

The purpose of this investigation was to isolate the elements of abrasive action and to determine the extent of the abrasion of each in the Los Angeles apparatus as used in A.S.T.M. method of test C 131-39.

The abrasive work done on a sample in the test is composed of at least these five elements:

1. The charge of steel balls for impact and attrition.
2. The drop of the charge and sample from the shelf to the drum.
3. The roll and tumble along the drum's inside circumference.
4. The impact of the shelf in picking up the charge and sample.
5. The impact and attrition of the aggregate particles upon each other, especially in the presence of large pieces in the long gradings and the gap gradings.

Crushed limestones, dolomites and blast-furnace slags from seven commercial sources were selected, which gave a wide range in Los Angeles abrasion losses. Sufficient quantities of these materials were separated into the required sieve fractions for all test purposes, being recombined later as desired to give the A and B gradings of as nearly uniform composition as possible.

In the series of tests outlined later the conditions were kept constant as far as the 500 revolutions and the sample gradings A and B are concerned. However, other conditions were varied as indicated under the individual series described below. Multiple samples were run until results were obtained which checked to within 1 per cent. of the average values.

Series A.—The *standard conditions* of the test, except that 12 cast-iron balls were used for both the A and B gradings instead of 12 for the A and 11 for the B grading as called for in the A.S.T.M. C 131-39 method. The values found ranged from 18.0 to 48.3 per cent. loss for the A gradings and 19.7 to 50.8 per cent. in the B gradings. These standard test values from each source are then taken as 100 per cent. for comparison with the later altered conditions in the series.

Series B. Shelf Padded.—The shelf of the Los Angeles machine was padded with 1¼-inch thickness of sponge rubber built up from ½-inch and ⅜-inch thicknesses. All other conditions of the test were identical with Series A. The results observed were that the A grading showed 91.9 per cent. of the loss under standard conditions while the B grading showed 82.0 per cent.

Series C. Drum Padded.—The entire cylinder of the drum was lined with a soft sponge-rubber mat ⅜ inch thick

[1] McKesson (C. L.). California Highways, vol. 3, No. 4, pp. 6-11, April 1, 1926.
[2] Woolf (D. O.) and Runner (D. G.). Proc. A.S.T.M., vol. 35, part II, pp. 511-529, 1935.
[3] Shelburne (T. E.). Purdue University Engr. Bull., Research Series No. 76, September, 1940.

Table I.—EFFECT OF ALTERED CONDITIONS OF TEST UPON LOS ANGELES ABRASION LOSSES

Series	Conditions of the Test	Results Expressed in Terms of the Averages Under Standard Conditions	
		Grading A (*percentage*)	Grading B (*percentage*)
A	Standard, except 12 balls for both A and B gradings	100.0	100.0
B	Shelf padded with 1¼-inch sponge rubber; other conditions as in A	91.0	82.0
C	Drum padded with ⅜-inch and ¾-inch sponge rubber; other conditions as in A	34.1	31.9
D	Shelf and drum padded as in B and C; other conditions as in A	24.1	23.3
E	Shelf and drum padded as in D, but no balls present; hence aggregate only	15.3	11.7
F	Number of balls varied from 0 to 18; other conditions as in A:—		
	No balls present	35.6	
	6 balls present	73.1	
	12 balls present	100.0	
	18 balls present	134.3	
G	Spot-padded to receive falling charge; other conditions as in A	37.4	28.7
H	Spot-padded as in G, but no balls present	17.2	14.6

with an additional thickness of sponge rubber placed under the mat in the area where the largest portion of the charge falls from the shelf. The face of the shelf, the number of balls and the number of revolutions were the same as in Series A. The result was found to be a reduction of the loss to 34.1 per cent. of the original in the A grading and 31.9 per cent in the B grading.

Series D. Shelf and Drum Padded.—In this case the shelf had a padding of 1¼ inch of sponge rubber and the drum was padded as in Series C, the other conditions being like those in Series A. The losses were reduced to 24.1 per cent. of the original in the case of grading A and 23.3 per cent. in the case of grading B.

Series E. Shelf and Drum Padded; No Iron Balls.—Only the aggregate was used as the charge in this series, with the shelf and the drum padded to reduce the wear to the minimum, as described in Series D. The losses were found to fall to 15.3 per cent. and 11.7 per cent., respectively, of the originals for A and B gradings.

Series F. Variation in Number of Balls.—In this series the conditions were standard as to shelf and drum, but the number of balls varied from 0 to 18 in 6-ball increments. The results were found to be the following for the A gradings only:

No Balls Present.—Only the wear of the sample against itself, the drum and the shelf produced a loss of 35.6 per cent. of the regular A-grading loss.

Six Balls Present.—The loss was 73.1 per cent. of the loss with 12 balls.

Twelve Balls Present.—100 per cent. loss.

Eighteen Balls Present.—134.3 per cent. loss.

Series G. Spot-Padded.—Only that portion of the drum was padded with ⅜ inch of sponge rubber upon which the balls and sample pieces impinge in their fall off the shelf. The losses obtained for grading A were 37.4 per cent. of the standard, while grading B showed a reduction to 28.7 per cent.

Series H. Spot-Padded; No Balls.—With no balls as an abrading charge and the fall of the aggregate softened by the spot pad as in Series G, the losses were reduced to 17.2 per cent. and 14.6 per cent. of the original with gradings A and B, respectively.

For the convenience of the reader, these varied conditions and the results obtained are repeated in Table I.

Deductions.—The above data warrant the making of the following deductions:

(a) The order of work done by the various abrading elements in the Los Angeles abrasion machine is, with the most effective first, the charge of balls, the drop off the shelf, the wear of the aggregate particles against each other, the impact of the shelf in picking up the charge, and the roll along the drum.

(b) The wear produced by the ball charge is in direct proportion to the number of balls. This is to be expected, since we are merely adding to the work input of the abrading machine when we increase the number of balls in the charge, other factors remaining constant.

Investigation II: Uniformity of Samples It seemed very desirable to use the most homogeneous material possible in studying the effect of size, gradation and surface area of the samples on the Los Angeles test values. Of the three commercial aggregates, gravel, slag and stone, only stone offered the probability of satisfactory uniformity. The following procedure was therefore used in securing homogeneous samples.

In each of the limestone and dolomite quarries sampled a 4½-foot thick ledge, which was observed to have the same characteristics as to crystallinity, texture, porosity and fracture habit throughout its thickness, was selected. A single block of stone from this ledge was chosen, hand-quarried and sledged down to 50- to 100-pound pieces with the least possible work done upon it. Approximately 5 tons of these pieces were trucked to a stone-crushing plant, where they were broken in a single pass through a primary gyratory crusher and separated into the several sizes by the plant's vibrating screens. These separated sizes were caught simultaneously in prepared bins, quartered down to the desired amounts and brought into the laboratory for the tests. Thus, it is the case that each aggregate particle, regardless of its size, is a portion of the same large block of stone selected for its obvious uniformity and reduced by primary crushing only.

Just how well homogeneity did result from these sampling precautions can be seen in Table II.

Table II —ABSORPTION AND SPECIFIC GRAVITY OF THE INDIVIDUAL FRACTIONS OF CRUSHED STONE—SOURCE T.

	Size (*inches*)					
	2 to 1½	1½ to 1	1 to ¾	¾ to ½	½ to ⅜	⅜ to 4-mesh
Absorption	1.20%	0.90%	0.91%	1.20%	1.21%	1.15%
Specific Gravity	2.68	2.70	2.70	2.69	2.68	2.69

The crushed particles from the same uniform block of stone from each source as just described were separated into 7 sieve fractions and recombined or used alone to provide 10 sizes of aggregate. Triplicate samples of these sizes were run with the 12-ball charge for the 500 revolutions of the Los Angeles test. In addition the surface areas of the several sizes were calculated using the method suggested by Edwards,[4] namely, assuming that one-third of the particles are of cubical shape and two-thirds are parallelepipeds having 7/6 the surface area of cubes of the same weight. It is obviously necessary to make particle counts on the individual fractions to determine the number of pieces actually contained in the charge of the abrasion test. The results of these determinations are shown in Table III and Figures 1 and 2.

Deductions.—The interesting fact is established that the original surface area of a homogeneous material is in definite relation to the loss sustained in the Los Angeles test. The values of k, or the increase in percentage wear loss per 1,000 square inches of surface-area increase, lie between 2.40 and 3.60 for the materials studied, which have B grading losses between 26 and 33 per cent. at 500 revolutions. It is, therefore, now possible to predict the losses of such material over a range of sizes. Furthermore, *equitable limits* for a ma-

[4] Edwards (L. N.). Proc. A.S.T.M., vol. 18, p. 236, 1918.

terial can be established for any desired size of the aggregate. All that is necessary is the knowledge of the surface area and the abrasion loss of one size of the material and the surface area of the size of the same material for which an equivalent abrasion loss is desired. This fact should aid materially in establishing proper specification limits.

It should be mentioned that this relationship can hardly be expected to hold strictly for all sizes of materials that are *not* structurally and materially homogeneous. However, recognition of this relationship in homogeneous materials points the way to establishing the presence of segregation and indicating the extent to which it may take place with nonhomogeneous materials.

To date some efforts have been made by several individuals and technical committees to obtain the *same* test results on a variety of sample gradings by altering the conditions of the test. Thus, if the Los Angeles value for the A grading with a 12-ball charge is 39 per cent. at 500 revolutions, attempts have been made to establish some set of conditions—such as using fewer balls, fewer revolutions or a different sieve size—under which the loss value is again 39 per cent. on a finer grading of the same aggregate.

Such an approach does not have the logic nor the freedom from confusion and mishandling in the laboratory that an orderly scale of permissible limits possesses, based on a fundamental concept of constant work input expended upon a known, though variable, surface area of aggregate. However, by utilizing the data outlined in this investigation it is easily possible to calculate, for example, how many fewer balls should be used to produce equal work effects on materials of different sizes and surface areas. Thus, for instance, stone M showed 28.6 per cent. loss for the usual A gradation and 38.7 per cent. for our gradation No. 5, both with the regular 12-ball charge at 500 revolutions. Our data in Series F, Investigation I, showed that the average effect per ball was

$$\frac{\frac{2}{3} \times 38.7}{12}$$

or 2.15 per cent. Hence, to reduce the work effect by (38.7 — 28.6), or 10.1 per cent., would require as many fewer balls as $\frac{10.1}{2.15}$, or 4.7. This suggests using either 7 or 8 balls instead of the usual 12. Since the size of the material in grading our No. 5 is all small (½-inch to 4-mesh), there are no large pieces of aggregate to act as abrading agents on the smaller particles. Hence, the 8-ball charge was selected. The tests under these conditions resulted in 28.0 per cent. loss as compared with the calculated 28.6 per cent., which is within the limits of accuracy of the test.

Table III.—SIZE, GRADING, SURFACE AREA AND GRADING LOSSES OF STONE SAMPLES FROM THREE SOURCES IN THE LOS ANGELES ABRASION TEST

Grading No.	Size of Sample (*inches*) and Weight (*grams*)	Source B		Source M		Source T	
		Surface Area Original Sample (*sq. in./ 5,000 g.*)	Percent Loss L.A.— 12-ball	Surface Area Original Sample (*sq. in./ 5,000 g.*)	Percent Loss L.A.— 12-ball	Surface Area Original Sample (*sq. in./ 5,000 g.*)	Percent Loss L.A.— 12-ball
1	2 to 1½—2,500 1½ to 1 —2,500	1,077	26.6	997	21.0	1,281	20.6
2	1½ to 1 —2,500; ¾ to ½—1,250 1 to ¾—1,250	1,831	30.1	1,613	26.9	1,982	23.6
3	1 to ¾—2,500 ¾ to ½—2,500	2,946	30.5	2,077	27.4	2,395	24.8
4	¾ to ½—2,500; ⅜ to No. 4—1,250 ½ to ⅜—1,250	4,386	37.1	3,545	32.7	4,263	27.7
5	½ to ⅜—2,500 ⅜ to No. 4—2,500	5,498	40.8	4,458	38.7	5,263	31.7
6	⅜ to No. 4—2,500 No. 4 to No. 8—2,500	8,967	53.9	8,949	51.2	8,550	40.7
7 L.A.—*A.*	1½ to 1 —1,250; ¾ to ½—1,250 1 to ¾—1,250; ½ to ⅜—1,250	2,507	32.0	2,163	28.6	2,378	24.8
8 L.A.—*B.*	¾ to ½—2,500 ½ to ⅜—2,500	3,597	32.5	2,997	29.5	3,219	26.1
9	⅜ to No. 4—5,000	5,968	45.2	5,552	41.2	7,353	35.8
10	⅜ to No. 4—3,750 No. 4 to No. 8—1,250	7,191	47.3	7,251	45.6	7,951	37.2

Surface-Area Determination. — Aggregates from numerous sources manufactured by various types of crushing and sizing equipment undoubtedly exhibit a considerable difference in the average particle shapes. Edwards[5] suggested the shapes of crushed aggregate particles as somewhere between cubes and parallelepipeds, considering the ½ and ⅔ portions, respectively, as the proper division. It is well known that a constant relationship exists between the sizes and surface areas of particles of any regular shapes, so long as one shape is maintained, throughout the distribution of sizes. Hence, any shape and surface area may be taken for comparative purposes in lieu of the actual surfaces of irregular particles, assuming that their irregularities do not change with size. While Edwards' proposal is as good as any which has been offered, the present authors wish to state that his formula gives surface-area values which are still below those of actual aggregate particles.

One of the present authors (Kriege) suggested some years ago[6] a method which is applicable to the actual surface-area determination of irregularly-shaped particles of dolomites and limestones of fairly uniform chemical and mineralogical composition. This procedure depends upon the rate of dissolution in acid media of sieve fractions of the irregular material in terms of known areas of the same material prepared by sawing out and polishing sections with plane surfaces which can be measured. This work showed that particle roughness or surface area-diameter relationship is a constant characteristic and maintained through the range of sizes below the 4-mesh at least. Martin, Bowes and Christelow[7] used a similar method for quartz. While these methods have demonstrated their accuracy, the somewhat limited extent to which they may be applied leaves us with the opportunity for further research in this field of coarse aggregate.

Investigation III: Modified Deval Abrasion-Test Results

Some state highway departments are using a modification of the standard Deval abrasion test for crushed coarse aggregates as well as for gravel. The modification consists of using 5,000 grams of graded commercial aggregate and a charge of six cast-iron balls instead of the standard Deval sample of 50 pieces of ledge rock shaped by hand into rough cubes of 100 grams each. The result of this change is a greatly

Table IV—SAMPLE GRADINGS FOR THE MODIFIED DEVAL ABRASION TEST

Between Square Opening Sieves (*inches*)	Gradings and Weights (*grams*)				
	A	B	C	D	E
2 to 1½	1,250	.....	.....	.....	.....
1½ to 1	1,250	2,500	.....	.....	.....
1 to ¾	1,250	1,250	2,500	.....	.....
¾ to ½	1,250	1,250	2,500	2,500	.....
½ to ⅜	.....	.....	.....	2,500	2,500
⅜ to No. 4	.....	.....	.....	.....	2,500

[5] *loc. cit.*

[6] Kriege (H. F.), *Rock Products*, vol. 32, pp. 73-80, May 11, 1929.

[7] Martin (Geoffrey), Bowes (Edgar A.) and Christelow (J. W.). Trans. Ceram. Soc. (Eng.) 25, pp. 59-62 (1925-26).

increased abrasion loss, so that stone showing 6 per cent. loss by the standard Deval method is found to have approximately 25 per cent. loss by the modified method in the concrete size of aggregate.

Five sample gradations are provided as shown in Table IV.

While these gradings differ widely in size, length of grading and surface area, it is interesting to note that some specifications in use do not accommodate the allowable losses to any of these variables in the original samples. The result is obviously an incongruous situation. Thus, crushed stone from the same uniform source may be comfortably within the specification for the gradings A, B and C, but may then be outside the permissible limits for gradings D and E, merely because of greater surface exposure and not because of any change in quality.

In view of this apparent confusion, it seemed necessary to investigate the possibilities of clarifying the situation with some basic facts. To this end samples of known uniformity were secured from three commercial sources of stone by the same procedure as outlined under Investigation II. These materials were then sieved into the five gradings shown above and run in triplicate.

The results shown in Figure 3 indicate much the same relationship between surface area and sustained loss that was found in Investigation II. It becomes clear, therefore, than an equitable specification for crushed stone should permit a considerably greater loss for the smaller sizes (D and E) than for the larger gradings (A, B and C) to maintain constant quality. Oddly enough, the opposite is found occasionally.

Producers of aggregates have no quarrel with the abrasion tests as an attempt to measure one quality or characteristic of the material, but it does seem pertinent that everyone concerned should avoid confusing *quality* of resistance to wear with some other property like surface area.

Investigation IV: Railroad Ballast

Not many data have been published giving the abrasive resistance of materials for railroad ballast as measured by the Los Angeles machine, even though this apparatus seems to offer some advantages in simulating the treatment ballast receives during placement and in use. It seems appropriate, therefore, to present some of our data on fifteen commercial sources of ballast, including crushed limestones and dolomites, trap rock and blast-furnace slag. These sources fairly represent the available ballast materials in the north central and eastern states.

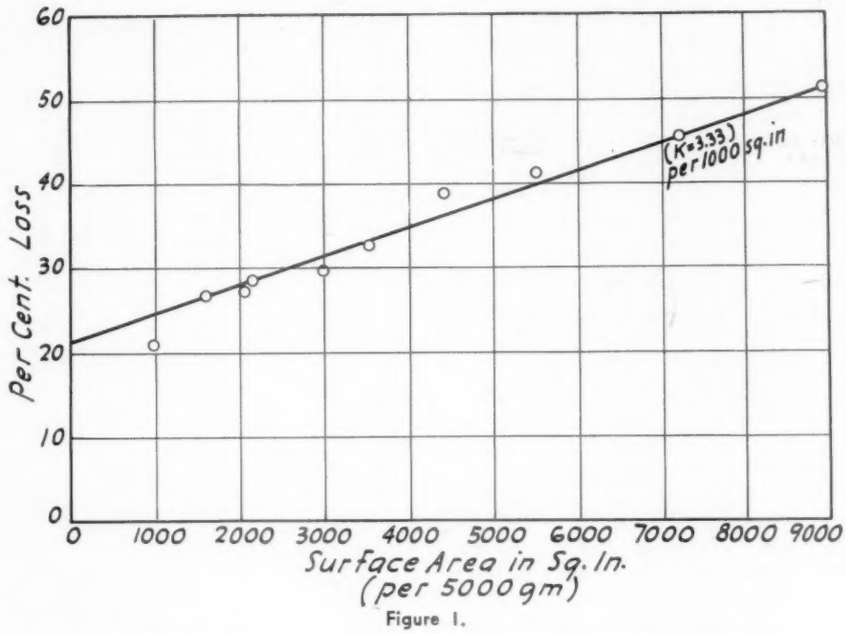


Figure 1.

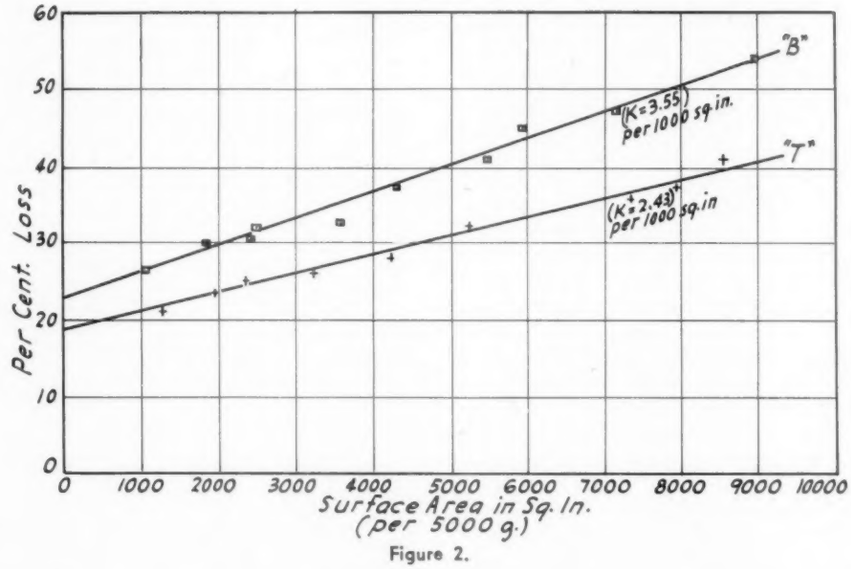


Figure 2.

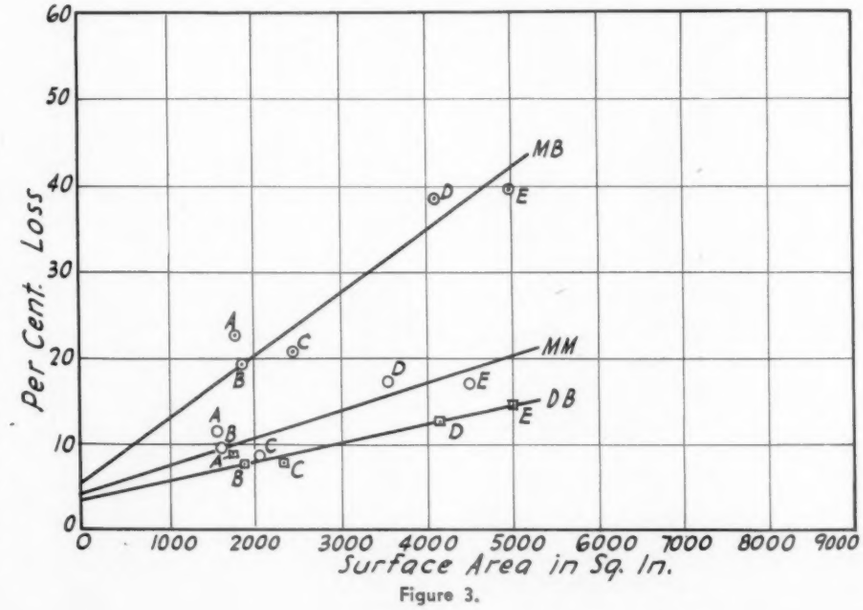


Figure 3.

The ballast grading used was the same for all the sources of materials tested in the Los Angeles apparatus, namely:

100 per cent. passing 2½-inch square openings
90 per cent. passing 2-inch square openings
54 per cent. passing 1½-inch square openings
5 per cent. passing 1-inch square openings

The regular A and B gradings were also run for comparison. It will be noted that the ballast sizing is larger than the A grading and does not contain much material below the 1-inch sieve.

The ballast grading showed a surface area averaging 957 square inches per 5,000-gram charge, while 2,330 square inches and 3,220 square inches were the values for the standard gradings A and B, respectively. The losses in the Los Angeles test, averaging triplicate determinations are shown for the fifteen sources in Table V.

Table V—BALLAST AND STANDARD GRADING LOSSES FOR FIFTEEN SOURCES

Source	Ballast Grading (*percentage*)	A Grading (*percentage*)	B Grading (*percentage*)
1	24.6	41.1	40.8
2	21.2	25.2	25.9
3	14.3	20.25	21.25
4	12.25	23.25	24.8
5	27.65	36.3	38.05
6	18.1	24.9	23.8
7	20.65	23.35	21.5
8	13.9	21.95	20.6
9	22.6	29.3	27.1
10	16.15	23.8	23.1
11	27.2	32.8	35.6
12	8.85	16.35	14.75
13	28.2	33.55	30.0
14	20.3	27.35	28.0
15	20.0	31.1	23.1
Average of 15	19.8	27.4	26.6
Average surface area in square inches per 5,000 grams	957	2,330	3,220

Using only the values for the ballast and the B gradings, we find that the relationship between the abrasion-loss increase and the surface-area increase gives a value for k of 3.00. This practically coincides with the average values of the three sources studied in greater range and detail under Investigation II. It appears, therefore, that the ballast size of crushed stone can be included in the same general concept for the other commercial sizes in evaluating abrasive resistances.

The reasons for not including the A grading values in the above calculation will be discussed later.

A-Grading Irregularities.—It has been observed in our work, as well as in previous investigations, that the Los Angeles losses for the A grading tend to approach quite closely those of the B grading even though the number of balls used in the test is the same, namely, 12. The recent revision of the standard method of test to the use of 11 balls with the B grading has brought these two values even closer together, which was the intended purpose. However, the surface areas of these two gradings differ by more than 1,000 square inches per 5,000-gram charge, so that the losses for the B grading should be between 3 and 4 per cent. greater than those for the A grading with materials of the same composition run under identical conditions except for the grading of the samples. This suggests an irregularity in our proposed utilization of the close relationship between the surface area in the sample and the loss in the Los Angeles test.

However, it is our belief that the irregularity can be explained by the fact that the A grading, running from 1½-inch down to ⅜-inch material, must be considered a really long grading, since the largest pieces present may be four times the diameter of the smallest size. Furthermore, the top size consists of fragments which are large enough to give quite a crushing and abrading effect on the smaller fractions of the sample as they are caused to impinge upon and tumble over each other. It is, therefore, our concept that the A grading tends to give higher values than it should because of having both small particles and large particles present, the latter contributing a sensible portion of the total abrading effect in the test.

In substantiation of this explanation we find that the ballast data presented in this paper line up quite perfectly with the B grading in their surface area-abrasion loss relationships, while the A values are consistently high. The ballast grading contains even larger particles than are found in the top size of the A grading, but the ballast grading ends at practically 1 inch and, hence, contains almost no smaller particles which can be acted on materially by the larger ones.

The No. 7 gradings (Los Angeles A) in Investigation II lie above the straight line connecting the other points in the series for all sources studied. The same tendency is observed generally for gradings No. 2 and No. 4 (1½-inch to ½-inch and ¾-inch to 4-mesh), which again are long gradings containing a ratio of 3 and 4 respectively between the diameters of the largest and the smallest particles.

A like trend is observed in the modified Deval abrasion series, in which the coarsest grading A shows values which are in excess of those for the gradings having a lesser spread.

In Investigation I, Series E, where the aggregate was the only abrading agent, the A gradings gave consistently higher losses than the B grading values.

These observations lead us to suggest that a new orderly size series for the Los Angeles abrasion test be established to cover the range of aggregates commonly used in highway construction. These should be essentially short gradings, having approximately a 2-to-1 ratio between the largest and the smallest particles present. To carry this suggestion one step further, it appears logical to list the following gradings, sized with square-opening sieves:

No. 1. 2-inch to 1-inch—surface area approximately 1,100 square inches per charge of 5,000 grams.

No. 2. 1-inch to ½-inch—surface area approximately 2,300 square inches per charge of 5,000 grams.

No. 3. ½-inch to 4-mesh—surface area approximately 5,000 square inches per charge of 5,000 grams.

No. 4. 4 to 8-mesh—surface area approximately 11,000 square inches per charge of 5,000 grams.

With such sample gradings and the use of the surface area-abrasion loss relationship we would be able to predict the losses over the entire range from the determination of one of the closely graded sizes, assuming, of course, a material which is fairly uniform throughout the size range of crushed particles.

Abrasion-Test Concepts.—The abrasion-test apparatus is merely a somewhat complicated work machine by which energy is expended upon a material. The major result of the work input is the production of new and smaller particles of all sizes down to and including dust. This causes a great increase in the surface area of the material. One of the fundamental laws of crushing was stated by Rittinger[8] as—"the energy required for crushing is proportional to the new surface formed." This has since been confirmed by numerous investigators, among them being Cross and Zimmerly[9] and Dean.[10]

The calculation of the new surface area is somewhat laborious and is liable to serious error unless ample precautions are taken to avoid loss of the extreme fines. Hence, it has been customary to substitute for this total area calculation a single arbitrarily chosen sieve, like the No. 12, to establish the "abrasion loss", or, in effect, the work done by the test machine. Such a substitution is permissible only if this "loss" is in constant relation to the total new surface area produced. Shelburne[11] found this to be correct in his recent

[8] Von Rittinger (P. Ritter). *Lehrbuch der Aufberertungskunde*, Berlin, 1867, p. 19.

[9] Cross (John) and Zimmerly (S. R.). Am. Inst. of Mining and Metallurgical Engr., Teck Publication 127, 1928.

[10] Dean (R. S.) Am. Inst. of Mining and Metallurgical Engr., Tech. Publication 660, 1936.

[11] *loc. cit.*

investigations. The present studies further substantiated this step, since any single sieve down to the 100-mesh gave the same order of abrasive resistance in the aggregates studied and gave loss values proportional to the sieve size used. The distribution of particle sizes is regular throughout the range below the size of the original sample. Therefore, while there is nothing sacred about the No. 12 sieve in connection with the abrasion test, and any other more commonly used sieve would serve just as well, there is also no good reason for objecting to the use of the No. 12 in establishing abrasion losses, as long as we stay with the present conditions of the test.

It has been stated that the loss at 100 revolutions is an indication of the amount of soft material present in the sample. Some state highway departments use the difference between the 100-revolution loss and 1/5 the loss at 500 revolutions as an index to the soft particles present. Obviously from the concept of work input and homogeneous material the resultant "loss" at 100 should check with 1/5 the loss at 500 revolutions.

All ten sizes, averaged for the three sources M, B and T of Investigation II, showed losses at 100 revolutions which were only 0.94 per cent., 1.0 per cent. and 0.63 per cent., respectively, greater than 1/5 of the 500-revolution losses.

It should be emphasized again that our present 500-revolution losses are of such magnitude that they do not have anything comparable in the field of uses. It is as if we were trying to determine how much energy is required to make agricultural limestone from concrete sizes of aggregate. Such information is interesting to some engineers, but not many, even in the producers' ranks. As Shelburne[12] has shown conclusively, the losses at *100 revolutions* are of much the same order as those sustained by the same aggregates in crushing under 5- and 10-ton rollers. It is the opinion of the present authors that such values are of practical significance and give real purpose to the running of the test.

Since so much depends upon the care with which the sample is sieved after the test, it seems that this point should receive more attention in the A.S.T.M. test procedure. Most laboratories having abrasion-test equipment also have mechanical-sieving devices. When materials are sieved by hand, the amounts passing a given sieve are usually less than those obtained by mechanical sieving. Of greater significance are the facts that mechanical sieving gives more concordant results and is accomplished with less effort and time expenditure. Numerous samples tested for abrasive resistance in this investigation were run by the hand-sieving and by the mechanical-sieving methods, with the results averaging 1.6 per cent. greater losses for the latter.

It is believed that this point should be more carefully guarded, since it may well mean the acceptance or rejection of a material near the critical specification limit. Likewise, it represents a probable source of error as large as, if not larger than, the usual variations from other causes between duplicate runs of the Los Angeles on the same materials. The present authors, therefore, recommend the use of mechanical sieving of the sample after the test run in the abrasion machines for the sake of accuracy, provided an additional tolerance is given in the specification limits to accommodate the somewhat greater losses found by this procedure.

Summary. — Four investigations of the Los Angeles abrasion and the modified Deval abrasion tests are reported. Some of the crushed aggregates used in this research were from normal commercial production, while others had special precautions taken to insure uniformity of mineral characteristics and composition as well as constancy of crushing work done on the product before test.

The Los Angeles abrasion machine was investigated to establish which of its elements performed the greatest abrasive action on the samples during the test. A study was made of the effects of the surface areas and gradings on the abrasion losses of uniform materials from three sources in both the Los Angeles and the modified Deval abrasion tests. The losses sustained by railroad ballast and the standard A and B Los Angeles gradings were determined for fifteen sources of commercial aggregates. A brief discussion of the concepts of surface area, abrasion apparatus as work machines, and the need of new sample gradings based on the known surface areas is given.

Conclusions.—The following conclusions may be drawn from the tests conducted under the conditions described in the foregoing investigation:

1. The Los Angeles abrasion apparatus is essentially a work machine which obeys the known laws for the crushing of mineral particles.

2. The greatest single abrasive action in the Los Angeles machine is produced by the charge of cast-iron balls, followed by the drop off the shelf, the wear of the aggregate particles against each other, the impact of the shelf in picking up the charge, and, lastly, the roll along the drum.

3. Quite satisfactory uniformity of aggregates can be secured by selecting a block of stone of observed homogeneity, sledging this down to 50- to-100-pound pieces which are then reduced by a single pass through a suitable commercial crusher, and separated into the desired sizes.

4. A definite and direct relation exists between the surface area of a sample and the loss it sustains in the Los Angeles abrasion test.

5. The surface area of a sample is a characteristic which should not be confused with its quality of resistance to abrasion.

6. Aggregates of uniform particle size or close gradings are the most satisfactory samples in the abrasion tests, since samples with a wide range of sizes, like the A grading, or with gap gradings tend to give somewhat higher results than expected due to the impact and wear of the larger pieces on the smaller particles.

7. The modified Deval abrasion-test results obey the same law observed for the Los Angeles test samples in that the losses are in relation to the original surface areas of the samples.

8. Specification limits for the abrasion losses of crushed stone should have increasing tolerances for sample sizes of increasing surface areas for both the Los Angeles and the modified Deval abrasion tests, provided that the work input is the same.

9. Railroad ballast lends itself well to the Los Angeles abrasion test, since the test imposes conditions similar to those encountered in field use and the grading is compatible to the concepts described in this paper.

10. The assumption of Edwards that crushed-stone particles may be assumed to be one-third cubes and two-thirds parallelepipeds in shape leads to surface-area values which are lower than actually exist under the conditions of this research.

11. The No. 12 sieve is as good as, but no better than, any other of the small-opening sieves in determining the losses in the abrasion tests.

12. In the Los Angeles machine the losses at 100 revolutions approximate closely one-fifth the losses at 500 revolutions with homogeneous materials.

13. The average value for k, or the increase in percentage abrasion loss per 1,000 square inches of surface area increase, is approximately 3.0 in the Los Angeles test of 500 revolutions.

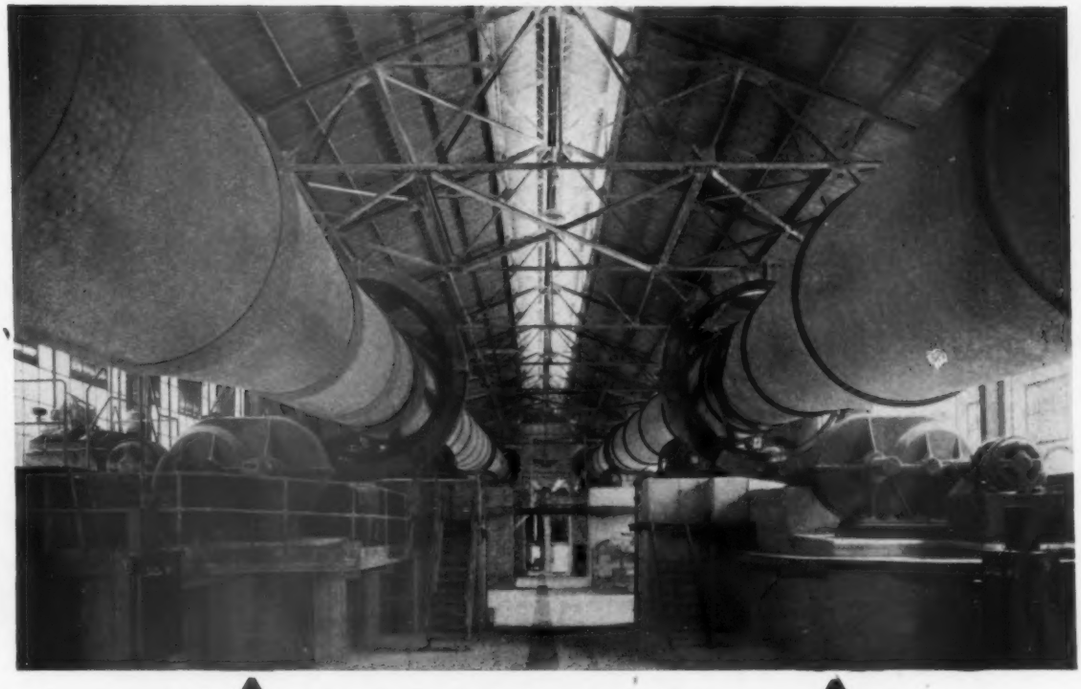
14. For the materials studied the value of k is approximately one-tenth of the Los Angeles abrasion loss of the B grading at 500 revolutions.

[12] *loc. cit.*

PIT AND QUARRY Special

LIME SECTION

UNAX ROTARY KILNS
for BURNING LIME *or* CEMENT



RIVETED CONSTRUCTION or WELDED CONSTRUCTION

The UNAX KILN for burning lime or making cement clinker, operates with very low fuel consumption, producing a product of high quality and uniformity.

The UNAX COOLER is integral with the kiln, providing efficient cooling by means of the air for combustion which is preheated to a high degree.

Other FLS Auxiliaries such as the KILN CONTROL, GAS ANALYZER, CHAIN SYSTEMS, PREHEATERS, etc., aid in the effective operation of the UNAX KILN.

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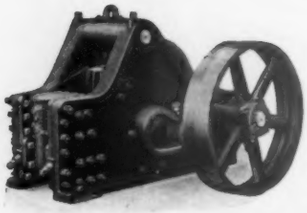
STURTEVANT EQUIPMENT

CRUSHERS

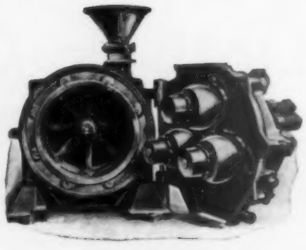


JAW

ROTARY

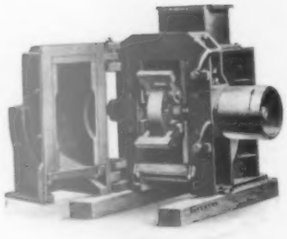
AIR SEPARATOR

SCREEN



RING ROLL

GRINDERS



HAMMER MILL

FOR THE PROCESSING OF

LIME and LIMESTONE

Jaw Crushers may be required for reducing the harder grades of materials but the Rotary Fine Crushers cannot be equalled for reducing 4"-6" lumps of soft or moderately hard materials to 3/8" size or coarser with a minimum of fines.

Hammer Mills are excellent grinders for some types of lime depending on the grades required, however, Ring Roll Mills are used for delivering uniform products between 6 and 200 mesh when operating with screens or air separators.

Sturtevant Air Separators are used for selecting extremely fine and uniform products and for increasing grinding capacities are operated in closed circuit with the grinding mill. Built in 8 sizes to meet any reasonable product recovery between 40 and 400 mesh.

For your ready reference file we will gladly send to you, free of charge, a copy of our "Bulletins in Miniature" covering Crushers, Grinders, Pulverizers, Mixers, Screens, Air Separators, Laboratory Machinery, etc., etc.

Just tell us to whom it should be addressed.

STURTEVANT MILL CO. HARRISON SQUARE **BOSTON, MASS.**

Lime Operator in Arizona Is Making and Marketing 38 Separate Products

Truck dumping to primary crusher with cars and electric locomotive below.

ONE of the last places a person would look for a lime plant would be out on the barren reaches of southern Arizona where, apparently, only lizards and cacti appear to feel at home. In the particularly desolate area between Bisbee and Douglas, Arizona is located the Paul Lime Plant owned by one of the most progressive producers to be found anywhere. This company has had a healthy growth and both its capacity and the line of products have been increased, the latter now totaling 38 items.

Alfred Paul, president of this company, in 1911 opened the original quarry to produce limestone flux for the huge copper smelters which are the chief industry in this section. Later in the year a small coal-fired lime kiln was built but at that time there was little demand for lime. By 1914 the demand for lime increased considerably and a 7-ton per day kiln was erected. Additional kilns were added from time to time until the present total of nine was reached. These kilns were all originally coal-fired; later oil was used to fire some of them. In 1930 natural gas became available and it was adopted for most of the original 10-ton kilns with a marked increase in their capacities.

In 1937 Victor J. Azbe was engaged to improve two of the original kilns. Center burners were installed and other improvements which were made increased the capacity of each of these kilns to 35 tons per day. Later Mr. Azbe improved two more kilns, increasing their daily capacities from about 25 tons to 40 tons each. Equally good results are expected from a fifth kiln on which work has just been completed.

The original demand for lime came mainly from copper companies for their flotation work. In 1923 E. J. Kuntz, then with the McGann Manufacturing Company, installed a Schulthess 2-ton per hour continuous hydrator to produce this material. Mr. Kuntz, now head of the Lime & Hydrate Plants Company, has since several times improved this hydrator, the last time being in 1937. It now produces 4 tons per hour operating 20 hours daily.

In 1934 a Fuller-Lehigh mill was installed to produce pulverized $CaCO_3$ and CaO_2 for several purposes. This mill was also used to pulverize silica for patching the ceilings of reverberatory furnaces and other similar work. Early in 1940 the need for additional grinding capacity became apparent and a Hardinge mill was installed and went into operation late in the year. This mill now does all the silica grinding.

Concrete products were added to the company's line in 1934, when the production of concrete tiles was begun. The ingredients used are 10-mesh to ¼-inch crushed stone, lime, cement, and sand. The product far exceeds all specifications. A Flam vibrator machine was first installed and a second similar machine has just been added. Concrete blocks, partition tiles, and bricks are now being made. All the products are cured for 4 hours in a cylinder under 110-pound steam pressure. The company also operates a sand-lime-brick plant in Phoenix, Arizona.

For the past several years the company has been spending a considerable sum of money in an attempt to increase the plasticity of its present hydrated and pulverized calcium oxide. Until a few months ago all these attempts resulted in complete failure. It is now announced that a new deposit has been located which contains calcium carbonate running 100 per cent. in purity, absolutely white and when burned the lowest test has shown a plasticity of 780. This particular new lime is yielding better than 425. It is expected that regular production of this lime will begin within the next 60 days. Being unable to find a satisfactory name for this product which would describe its per-

A view of the kilns with trolley locomotive and cars above.

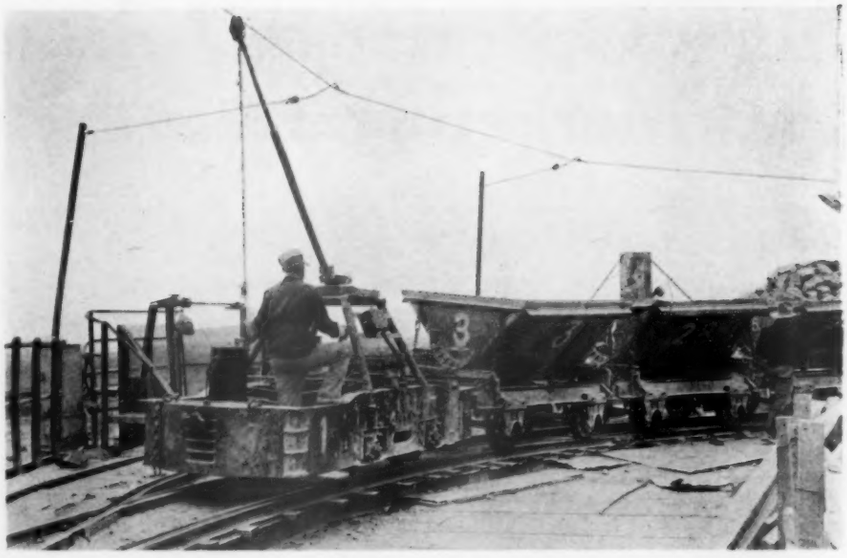
fect color, yield, plasticity, spread, and so forth, it was decided to simply use the initials of the Paul Lime Plant, that is, P L P as a name for this product. The company is in a position to produce this lime in quantity and to produce at a very low figure stone running from 8 inches in size to any size, any specification, down to 100 per cent. passing 325-mesh. This material is to be sold as cattle-feed, chicken mash, chicken grit and also as a base in the manufacture of paint.

The quarry is in a deposit of high-calcium limestone in a fairly-solid formation. Drilling is done in benches with Ingersoll-Rand jackhammers.

The ¾-cubic yard electric shovel loading trucks in quarry.

Apache Powder Company 45 per cent. Amogel is used in most of the holes, while 15 per cent. Amogel is used in the shallow holes and for secondary blasting. The 20-foot-deep top holes are detonated electrically and the others by fuse. Air for drilling is supplied by a 2-stage Ingersoll-Rand compressor.

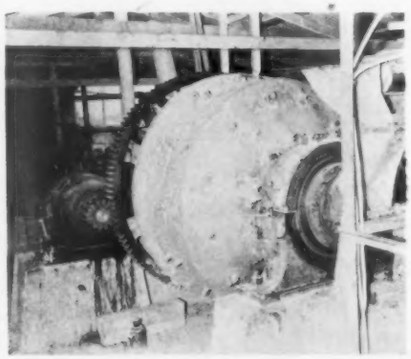
A Marion 330 electric shovel with a ¾-cubic yard dipper is used for loading. Locomotives and cars were originally used for haulage but these were replaced a few years ago by trucks. Three trucks—a 4-cubic yard Dodge, a 6-cubic yard International, and an 8-cubic yard Mack—are used. As one truck is being loaded while the other two trucks are in transit only two drivers are employed.



Locomotive pushing cars over tops of the kilns.

The quarry-run rock is dumped from the trucks into the 20- by 48-inch Birdsboro primary jaw crusher. The minus 10-inch crusher product goes over a 3-inch grizzly. The throughs and the oversize go into cars on separate tracks. The 3- to 10-inch oversize stone is kiln feed and the minus 3-inch stone is called waste and is used for flux and crushed stone. The cars are hauled up an incline by a hoist and cable. On the level all the hauling is done by Plymouth electric-trolley locomotives. All cars containing kiln stone are weighed on a Howe track scale as the quarry workers are paid in proportion to the amount of kiln stone produced. Direct current for the locomotives is supplied by a 400-ampere, 125/150 volt General Electric generator driven by a 150-horsepower General Electric motor.

The waste stone is dumped from cars into a bin at the crushed-stone plant. It is then discharged over a grizzly into a Telsmith gyratory crusher. All the material goes to a Cole vibrating screen which makes either crushed stone or flux stone. When making crushed stone the oversize from the screen goes on a belt-conveyor to railroad cars for shipment. The throughs go to another belt-conveyor to be wasted. When minus ¼-inch flux is produced the material retained on the screen is elevated to a roll-crusher from which it is returned to the screen on a belt-conveyor. All the material falling through the screen goes on the car-loading conveyor.



The new mill for grinding refractory silica and its 30-horsepower gearmotor drive.

About 50 tons of flux is produced daily and this is shipped as far as Phoenix, over 200 miles away. The

Top of one of the center-burner kilns showing hood door and draft fan.

crushed stone is used mainly for concrete in road work or other construction. The output of this material averages about 100 tons per day.

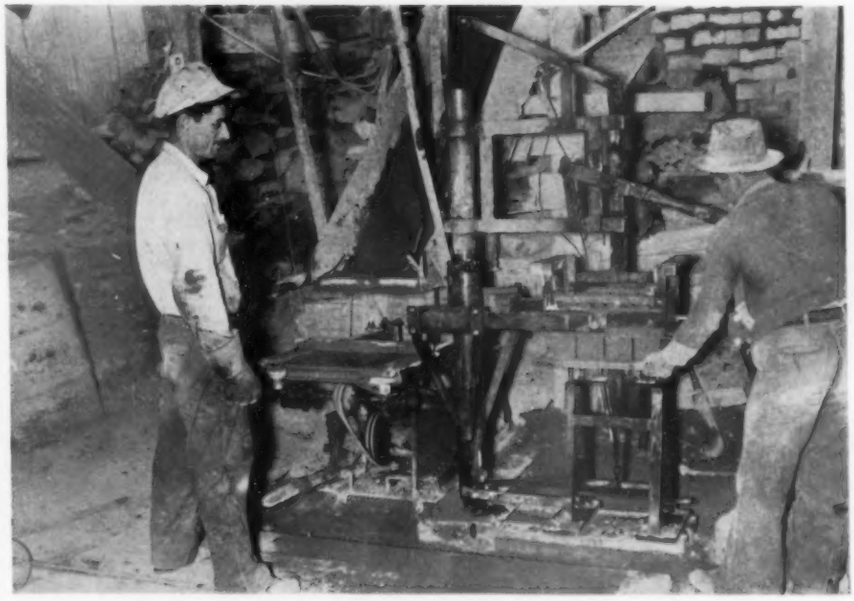
This crushing plant is also used in the production of pulverized silica, rock for which is obtained from a quarry 5 miles from the plant where a "Roller-Bear" jaw crusher reduces it before it is conveyed to a truck-loading bin. The silica is hauled in trucks to the crushing plant where it follows exactly the same crushing and screening flow as the flux. In this case, however, the material falling through the screen is discharged from the car-loading belt-conveyor on another conveyor leading to a storage bin. Another belt-conveyor feeds the silica from this bin into a small mill-feed hopper. Upper and lower Bindicators on this hopper control the operation of this conveyor to insure a constant supply of material in the hopper.

The feed bin over the silica-grinding mill showing conveyor, upper and lower bin indicators and constant-weight feeder.

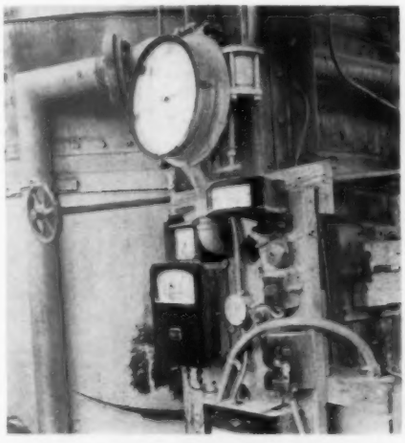
A Hardinge constant-weight feeder under the hopper supplies the Hardinge air-swept conical mill. This mill has a rated capacity of ½ ton per hour but is producing up to 1,400 pounds per hour of minus 200-mesh material. A perforated plate at the discharge end of the mill retains the coarse material and takes the place of the usual separator and oversize return. The finished product is drawn out of the mill by a Clarage fan into a cyclone, from which the finished product drops into the feed bin of a 1-tube Valve Bag packer. The mill is driven by a 30-horsepower General Electric gear-motor.

The electric locomotives push the cars of kiln stone on tracks over the tops of the nine vertical kilns into which the stone is discharged. Six of the kilns have 14-foot-diameter shells 40 feet high above their discharge points. The other kilns are considerably smaller. Two of the large kilns and the three small kilns are gas-fired through center burners. Two of the large kilns are fired with gas through open fireboxes and one is a coal-fired mixed-feed kiln. The natural gas used has a 1,150-B.t.u. content. The two large center-burning kilns are equipped with hoods and Clarage suction fans. Forced draft is used on the other kilns which have Clarage blowers. Foxboro gas-flow meters, Hays draft indicators and Brown electric pyrometers are used to control the two suction-draft center-burner-equipped kilns. The pyrometer indicates the temperature at the fan which is kept at 400 degrees F. Manual controls are used to operate the blower-equipped kilns.

The large kilns are drawn every 3 hours and the others every 4 hours. The lime is taken in wheelbarrows to the sorting floor where the cores are removed. Lump lime is wheeled into cars for shipment. Lime for the hydrators is wheeled to a double-roll crusher which reduces it to ¾-inch size and under. The crushed lime is then wheeled to a 10-ton steel bin from which an automatic feeder supplies the lime to the Schulthess continuous hydrator. The hydrated lime is elevated to a mechanical separator from which the finished product goes into a 25-ton bin over a Bates 2-bag packer.



The first of the two vibrating block machines installed in this plant.



The No. 6 center-burner kiln with flow meter, draft indicator, electric pyrometer, etc.

The separator rejects go to a hammer-mill from which the final rejects are wasted, the product going back into the hydrator.

The product of the roll-crusher can be diverted into the Fuller-Lehigh mill when processed lime is desired. A separate packer is used for this product.

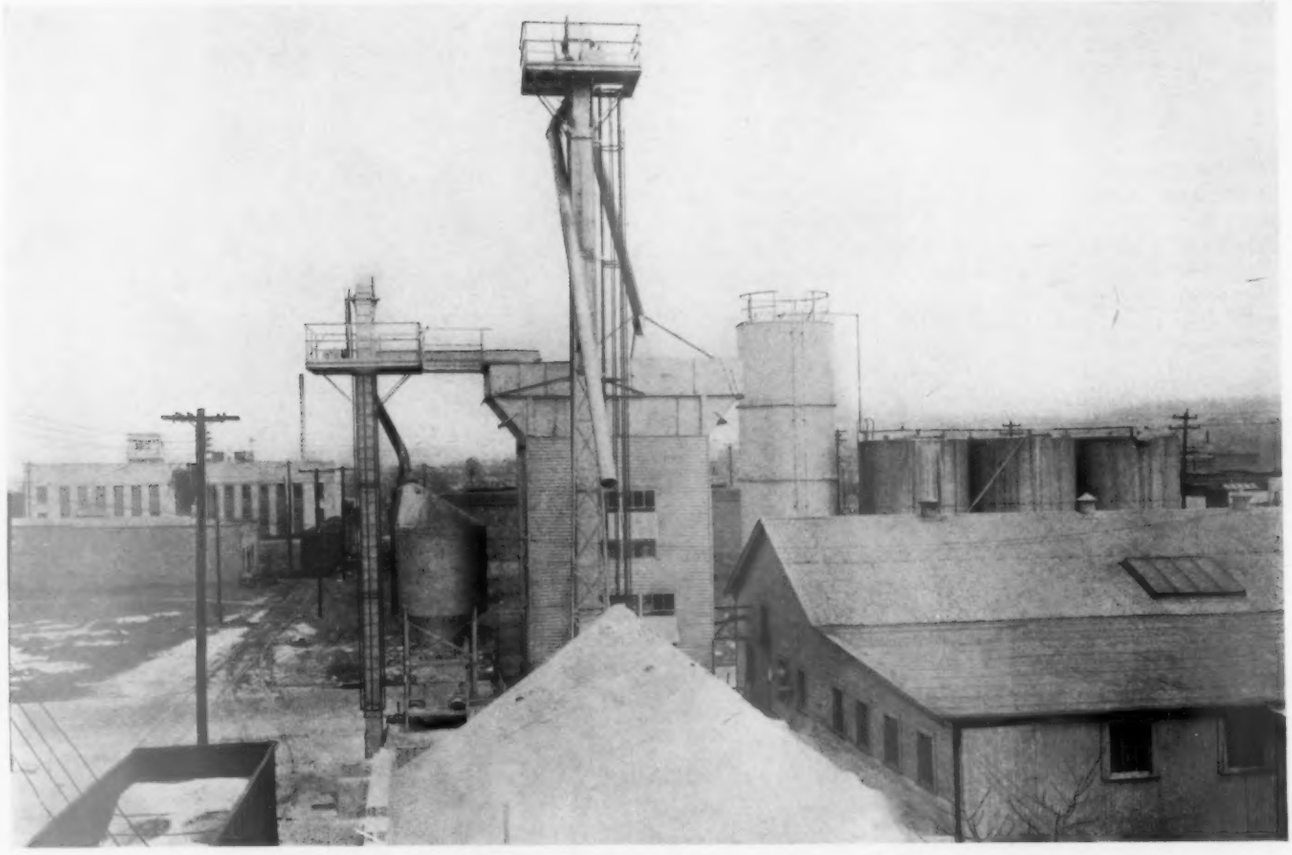
This packer is also used for "Cal-Pho-Sol" a cattle feed which is a combination of salt, calcium carbonate and bone meal. A small mill is used to grind this mixture.

There is also equipment in this plant for grinding and mixing cold-water paint. This product is used for painting concrete, rock, and other exposed surfaces.

Starts Season with Many Unfilled Orders

The Ridgeville, Indiana plant of the Mid-West Rock Products Company has started production on what officials believe will be the biggest year's volume of business in its history.

Orders are on hand for 120,000 tons of stone. New equipment has been installed and output has been stepped up to 70 tons per hour. Three new 5-ton International trucks have been purchased.



A general view of the new Birmingham plant of the Standard Building Material Company.

NEW LIME-PUTTY PLANT APPROACHES THE IDEAL AS CONCEIVED BY ITS INVENTOR

IN the past few years a number of articles have been published in these pages describing the installation of Brooks-Taylor lime-putty plants in various large cities. Little has been said, however, about the man who is responsible for this improved lime-putty production system or about the plant he operates in Birmingham, Alabama. The original plant of the Standard Building Material Company, in which Hayden Brooks developed this system, burned to the ground on September 27, 1940. Undismayed Mr. Brooks at once proceeded to build a new all-steel-and-concrete plant which approaches his ideal of what a lime-putty and ready-mixed-mortar plant should be. This plant went into operation January 28, 1941.

The history of this process goes back to 1919 when the Standard Building Material Company was formed to deal in a general line of building materials. In 1926 Mr. Brooks left this company in order to organize the Blue Diamond Company, Inc., which produced ready-mixed mortar under the Blue Diamond patents and sold its products exclusively through dealers. In 1932 this company was merged with the Standard Building Material Company of which Mr. Brooks is now president.

During these years Mr. Brooks sought some means of eliminating the excess water formed in the vats during the slaking and aging of the putty. He finally conceived the idea of using filters in vertical cylindrical tanks. In 1928 he installed three such tanks in his plant, retaining the Blue Diamond mixing plant. In these tanks putty was cured in 7 days instead of the 30 days formerly required. A more definite control of consistency and a more consistent and workable brick mortar resulted.

Mr. Brooks then applied for a patent on the use of filters in tanks and this was granted in June, 1931. The method patent was granted in May, 1936. Mr. Brooks then worked out a standard plant design for this system with engineers of the Chicago Bridge & Iron Company which company now builds them for him. The first plant was installed by the Warner Company in Wilmington, Delaware, in 1937. Since then other plants have been installed in New York, Philadelphia, Harrisburg, Chicago, Washington, Cincinnati, Richmond, Indianapolis, Louisville, New Orleans, Houston, and Columbia, South Carolina.

In his own new plant Mr. Brooks used the standard Brooks-Taylor system and equipment for the lime-putty plant. A new Brooks-Taylor aging tank was added to the original three tanks which survived the fire. A standard Blaw-Knox batching plant was installed for mortar production. The Continental Gin Company supplied the elevators, screw-conveyors and belt-conveyors which are driven by weatherproof gear-motors. This plant has a capacity of 30 cubic yards of mortar per hour which means a 1-cubic yard batch every 2 minutes.

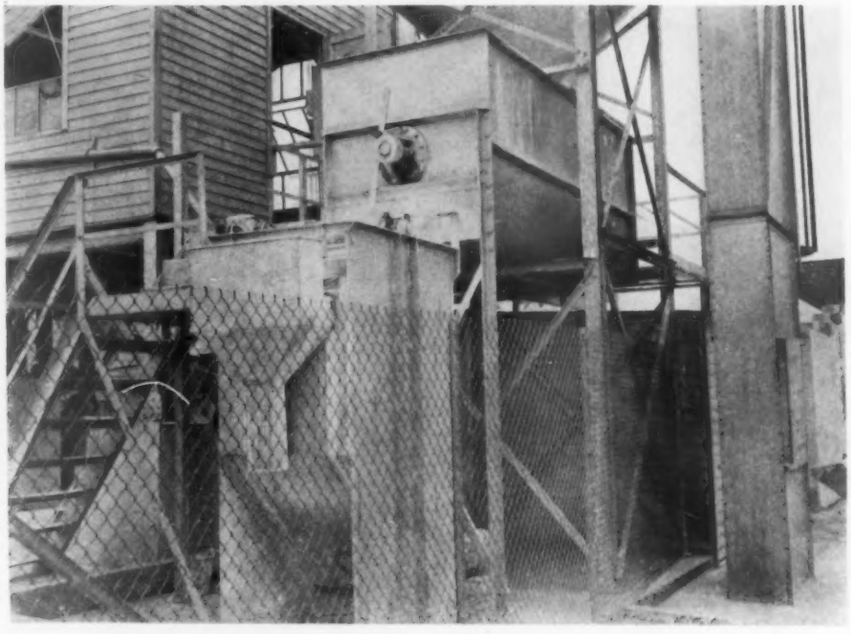
One of the features of this plant is its compactness which is nowhere better exemplified than in the sand storage

and reclaiming system. The sand is discharged from hopper-bottom cars into a track hopper from which an 18-inch by 35-foot belt-conveyor carries it through a concrete tunnel to the 18-inch by 50-foot tunnel belt-conveyor which is at right angles to it. The conveyor feeds the sand to a 70-foot centers Continental steel-inclosed belt-bucket elevator with a capacity of 85 tons per hour. A selective gate controlled by wires from the ground makes possible the discharge of the sand either into the mixing-plant bin or to the stock-pile which is inclosed in a space 38 feet by 46 feet by an 8-foot concrete-block wall. The storage capacity is 500 cubic yards of which 60 per cent. is live storage. The sand is reclaimed through eight gates in the concrete tunnel in which is the 50-foot conveyor already mentioned. These gates are of original design and are of the counter-balanced drop type with side-plate guides to keep the sand in the center of the conveyor. A slide cut-off gate is used. The high percentage of live storage is made possible by the retaining wall, the closely-spaced tunnel gate, and the fact that the tunnel is almost completely below ground-level.

Weighing batcher which holds 2 cubic yards of sand and 1,000 pounds of cement.

A view showing the elevators, bins and aggregate storage.

Another plant view with office building at left.



This view shows the slaker and vibrating screen.

The Blaw-Knox steel bin has two compartments, one holding 100 tons of sand and the other 180 barrels of cement.

The bulk cement and the quicklime are received in box cars, hopper cars or trucks. Under the sidetrack is a 12-inch by 10-foot screw-conveyor. A special collapsible chute is used when unloading from box cars by means of a wheeled scraper. A special hopper is used to feed from trucks to this conveyor. Cement or lime in hopper cars is discharged direct to the conveyor. The screw-conveyor feeds the cement or lime to a 50-foot centers Continental steel-inclosed chain-bucket elevator which has a capacity of 40 tons per hour.

At the top of this elevator is a selective gate through which quicklime is discharged into an 18-ton slaker-feed tank. The bulk cement is discharged through this gate to a 12-inch screw-conveyor which carries it 20 feet horizontally to the bulk-cement compartment of the Blaw-Knox bin. Pozzuolan cement is used in this plant.

The quicklime is discharged from the above-mentioned tank into a horizontal blade-type slaker and the heat of hydration is controlled by means of a Taylor recording thermometer. The milk-of-lime flows from the slaker over an 8-mesh vibrating screen which removes any cores or lumps. A 3-inch Deming pump feeds this fluid to one of the four aging tanks. Each of the three original tanks is 12 feet in diameter and 20 feet high with a capacity of 2,200

Bucket Elevators, Belt Conveyors and Screw Conveyors for handling Bulk Lime, Cement and Sand in this Lime Putty Plant of Standard Building Materials Company, Birmingham, Alabama, Engineered and Manufactured by Industrial Division, Continental Gin Company.
Specify
"CONTINENTAL" MATERIALS HANDLING EQUIPMENT
Belt Conveyors, Screw Conveyors, Bucket Elevators, Apron Conveyors, Drives and Accessories.

Do you have a Materials Handling problem? Our staff of experienced Engineers will be glad to cooperate with you in helping you solve your particular problem. Three large plants from which to supply your requirements.

Industrial Division

CONTINENTAL GIN COMPANY

CGC ATLANTA • BIRMINGHAM • DALLAS • MEMPHIS

Mortar mixer with spout in position to load sand from batcher direct to trucks.

cubic feet and has a flat bottom. The new tank is 10½ feet in diameter and 20 feet high with a capacity of 2,500 cubic feet and has a conical bottom.

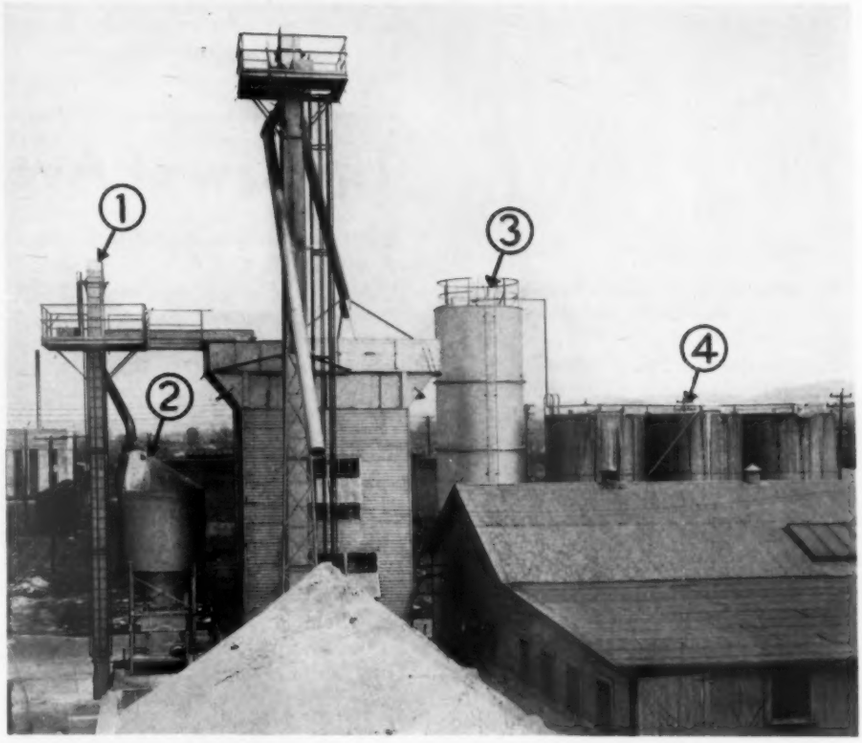
Compressed-air jets are used to agitate the stiff putty when withdrawing it from these tanks. The entire contents of a tank are discharged at one time into one of the original 23,000-cubic foot-capacity Blue Diamond vats. Very little bulk lime putty is sold and this is discharged from the tanks direct into trucks.

The vat is equipped with a travelling agitator and putty is withdrawn from it by a Carter "Humdinger" duplex sludge pump. This feeds the putty to a Deming 3-inch pump above it which evens out the rate of discharge. Between the pumps is a Y in the pipe-line which diverts the putty back into the vat when the valve in the mixer-feed line is closed. This system eliminates the constant starting and stopping of the pumps when the plant is busy.

Sand is discharged from its bin

Pump which elevates putty to the mixing floor.

Producing Mortar with a BROOKS-TAYLOR *Lime Putty Plant and Central Mixing*



1. Lime elevator. *2. Lime storage bin.*
3. New ageing tank. *4. Old putty tanks.*

Fifteen years ago Hayden Brooks went into the business of supplying sanded lime putty for brick mortar in Birmingham, Ala. Out of his early experiences has come the development of the Brooks-Taylor method of producing and handling aged lime putty for use in making lime mortar.

The above illustration shows standard Brooks-Taylor lime putty plant equipment at the Standard Building Material Co. plant in Birmingham, of which Mr. Brooks is an official. Bulk lime is unloaded into the boot of an elevator and elevated to a lime bin. The quick lime is slaked mechanically under thermal control and pumped to the ageing tanks where patented filters carry off excess water in one quarter the time it takes to evaporate from a vat or bin.

The aged putty is mixed with sand in a central mixing unit and delivered, ready for use as soon as cement is cut into the mixture.

Brooks-Taylor plants produce a uniform high quality product at minimum handling costs. Write for data.

CHICAGO BRIDGE & IRON COMPANY

Chicago ..... 2451 McCormick Bldg.
New York ..... 3389—165 Broadway Bldg.
Cleveland ..... 2264 Builders' Exchange Bldg.
Philadelphia ..... 1645—1700 Walnut St. Bldg.
Boston ..... 1550 Consolidated Gas Bldg.
Houston ..... 5621 Clinton Drive
Tulsa ..... 1648 Hunt Bldg.
Birmingham ..... 1503 North Fiftieth St.
Dallas ..... 1486 Praetorian Bldg.
Detroit ..... 1552 Lafayette Bldg.
San Francisco ..... 1092 Rialto Bldg.
Los Angeles ..... 1457 Wm. Fox Bldg.

Plants at BIRMINGHAM, CHICAGO, and GREENVILLE, PA.

through manually-operated clam-shell gates and cement through a rotary cement valve into the 2-compartment Blaw-Knox weighing batcher. This machine has a capacity of 2 cubic yards of sand and 1,000 pounds of cement, and has a 2-beam scale. The cement

Thermometer which records heat of hydration during slaking.

compartment is fully inclosed to prevent loss of cement. The cement and sand are discharged from the batcher and the lime putty from its pipe into the 1-cubic yard Multiplex double-paddle mixer. The amount of putty required for each batch is estimated by the skilled operator from experience. The finished mortar is discharged from the mixer through a chute into trucks.

The spout through which material is discharged into the mixer can be shifted by a lever on the batching floor so that sand can be batched and discharged direct into trucks for general building purposes. All the other controls are also located on this floor so that the operator need not move from his post. These controls include push-button switches for the pumps, mixer, elevators and conveyors and levers for the gates, spouts, etc.

According to Mr. Brooks the demand for lime putty and ready-mixed mortar is high in this locality and in those areas in which the other plants are located. Mr. Brooks has supplied mortar to many defense and re-armament projects and to four large housing projects. The contracts for mortar for another housing project and for a new $1,000,000 Sears-Roebuck store have just been obtained. The high level of business in general and the fact that steel mills in the Birmingham area are operating at 100 per cent. capacity have also resulted in a "boom" in private building construction with a resultant increase in the demand for mortar.

The Law of Averages!

By E. I. WILLIAMS
General Manager
Riverton Lime & Stone Co.

THOSE hardy souls who were able to wade through the article, *Salesmen's Reports Give Us a True Picture of Conditions in Our Field,* in the September, 1940 issue of PIT AND QUARRY may recall that one of the reports sent to each salesman monthly was a summary of the calls made by him for the month, listing the architects, dealers and contractors called on.

This report was of course made up for our information in the office, but a copy was sent to the salesman with the hope that he would go over it in detail and check the areas he *was* working and those he *was not* working as he should against the construction in those areas, and the sales made.

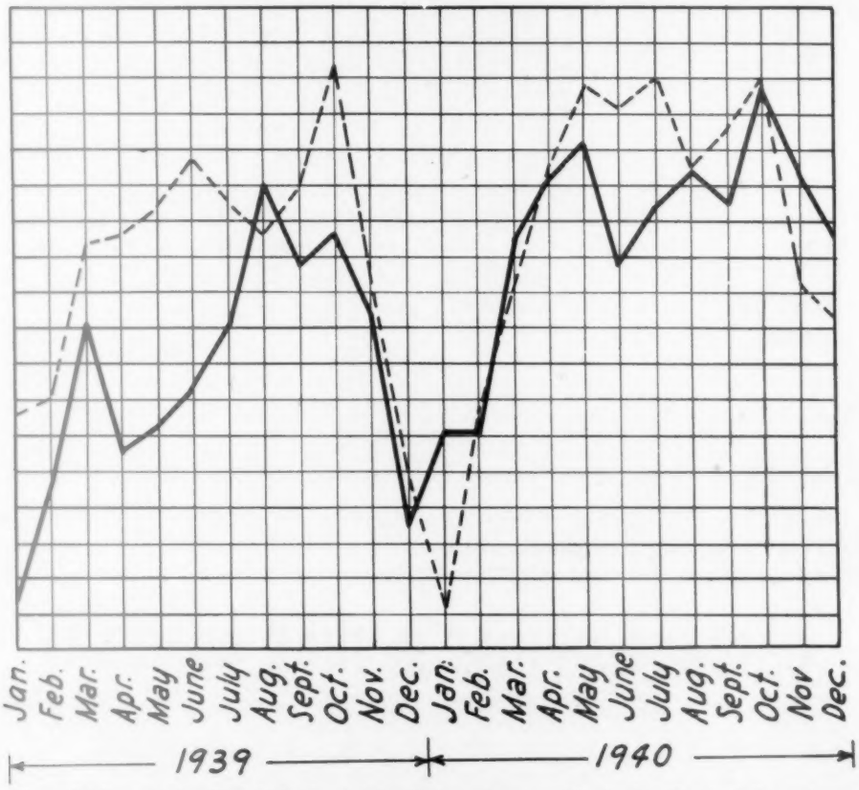
Life-insurance companies base their entire business on the "law of averages," not only with respect to the mortality tables, but also in the selling end. The old stand-by, as we remember it, was something along the line of "the more prospects you expose yourself to, intelligently, the more sales you will make." This has been preached to our men and perhaps grudgingly accepted by them—not with a grain of salt, but with a ton!

At the end of this past year, therefore, we made up curves for each salesman showing the number of calls made monthly—we had to assume they were made intelligently—and the dollar sales for each month. In some of these charts the two curves were quite similar, while in others the similarity was not so great. So we added a third curve, showing the amount of construction awards made in the salesman's territory, as obtained from the Dodge reports.

This did explain in some cases why the other two curves differed; that is, why, with fewer calls, the sales volume might increase, because the construction increased, and *vice versa.* But it was rather surprising that for any one territory the amount of construction in a given month was not so important a factor in the sales volume as the number of calls made by the salesman. Of course, one should appreciate the fact that there might be a lag between construction awarded and sales for such construction.

A chart was then made of the number of calls and the dollar sales for all salesmen, combined. One would expect that this would have many compensating factors, and should give a pretty good picture. We believe it is of sufficient interest to reproduce, and it is shown in the adjoining column. We have not shown the scales used, but certainly no one can look at it without noticing a definite similarity between the two curves, regardless of the scales used. The curves do not follow each other perfectly, but there is enough similarity to indicate that the "law of averages" still functions, and to prove the old Chinese proverb:

"Salesman who covers chair instead of territory remains long time on bottom!"



The solid line on the chart indicates total calls by salesmen. The broken line is dollar volume of sales. Figures have been eliminated for obvious reasons.

Legislators Enact Measures Applying to Lime and Aggregates Industries

By Z. H. MISCHKA

APRIL brought enactment of additional measures applying to the stone, lime and gravel industries in many states, and as the month drew to a close two-thirds of the 43 state legislative bodies that convened in January had completed their work and adjourned. Legislatures in several other states prepared to complete their work during May, while a few may continue their sessions into June.

With a few exceptions, state lawmaking bodies meeting this year will not convene again until 1943. Special sessions are being talked of in some states but, if called, the legislators will confine their attention to revenue measures or to proposals to bring about greater state coöperation in the national defense program.

State legislative activity of the past month included:

Arizona.—Charging the Arizona Department of Mineral Resources engaged in disseminating "propaganda" on matters of "taxation, social legislation, and kindred subjects," Governor Osborn practically abolished the department after the legislature adjourned by vetoing its appropriation of $57,400 for the next biennium.

"There can be no criticism of the large mining companies for placing their views before the public on matters of taxation, social legislation and kindred subjects," the governor said. "However, there can be proper criticism of any state authority which spends the people's money for such purpose."

Earlier, the governor named the following to the state mineral resources board: Kueun R. Savage, Winslow; E. C. Seale, Prescott; Norman Adair, Yuma; George M. Goodman, Mesa; and Nick C. Hall, Tucson.

The legislature passed and the governor signed bills to provide for location on, filing and leasing state lands on which mineral deposits have been discovered; and to establish the minimum population of a city or town having a sealer of weights and measures at 7,500.

The legislature rejected a bill seeking to make silicosis an industrial disease compensable under the workmen's disability act.

Arkansas.—Following adjournment of the legislature, the governor signed a bill permitting the state, counties and road districts, or any federal agency to take sand and gravel from navigable streams or lakes for road-building purposes without payment of severance taxes.

A bill that became law 20 days after adjournment for failure of the governor to act within the time limit requires that preference be given to Arkansas products in the purchase of supplies and materials for state, county, municipal and school use, if they are not of inferior quality. It allows a differential up to 5 per cent. in cost in favor of state materials.

California.—Both houses approved and sent to the governor for his signature or veto a bill to appropriate $30,000 for operation by prison labor of rock-crushing plants. Of that amount, $5,000 is to be expended for purchase of tools, machinery and other material and appliances.

Illinois.—House committees gave favorable reports to bills to amend the state contracts act to provide that in the determination of the lowest responsible bidder preference shall be given to a person or corporation whose plant is located within Illinois if his or its bid is not more than 10 per cent. greater than the bid of a person whose plant is located outside the state; and to add a section to the traffic act to provide that no vehicle containing ground limestone or other powdered rock product shall be driven or moved on any highway unless it is covered or unless such product is so dampened or treated as to prevent any of it from being blown from the vehicle.

A new bill, referred to the house committee on efficiency and economy, would require that there be included in all contracts for the purchase of supplies and materials by the state, covenants that the contractor will not interfere with, restrain or coerce its employees in the exercise of their rights in joining labor organizations or bargaining collectively, discriminate against employees because of their labor affiliations, attempt to control the labor organizations, blacklist any employees for labor affiliations, or deal with any firm for materials to be used in the contract when such firm does any of the enumerated acts.

The senate advanced toward passage a bill to license and regulate itinerant merchants.

Iowa.—New bills introduced in both branches would regulate the manufacture, distribution and possession of explosives.

No action had been taken on a bill to permit a county board of supervisors to sell material from county gravel pits to private parties "at not less than cost" to surface driveways and lanes connecting surfaced public roads and streets with lots and buildings. The measure received a favorable report from the house committee on county and township organization late in February.

Kansas.—A bill to require the payment of workmen's compensation benefits in cases of occupational diseases was stricken as the senate cleared its calendar to prepare for adjournment.

Maine.—A senate bill to regulate the manufacture, sale, distribution, use and possession of explosives was referred to the committee on the judiciary.

Maryland.—The legislature passed and sent to the governor a bill to regulate the manufacture, sale, distribution, use and possession of explosives.

Michigan.—A senate bill given a favorable report by the committee on labor would eliminate the present schedule of 38 diseases compensable under the workmen's compensation act, substituting compensation for any disease or disability "due to causes and conditions which are characteristic of and peculiar to a particular trade, process, occupation or employment."

A new house bill, referred to the committee on the judiciary, would authorize investigations by prosecuting attorneys of false advertising.

New Jersey.—The governor signed a bill passed by the legislature to regulate the manufacture, sale, distribution and use of explosives under the department of labor.

New bills would amend the workmen's compensation act to provide that where an employee sustains injuries in the course of employment and death ensues, it shall be presumed, subject to rebuttal, that his death arose out of his employment; and would fix a penalty of $50 or 30 days in jail for defrauding in "weighing any goods, wares or merchandise of any kind."

New Mexico.—Final legislative approval was given a bill amending the state sales tax to increase the rate on minerals, sand and gravel, whether processed or refined in the state or not, from ¼ to ½ per cent. Signed by the governor, it was expected to raise an additional $65,000.

The senate killed a bill seeking to

(Continued on page 65)

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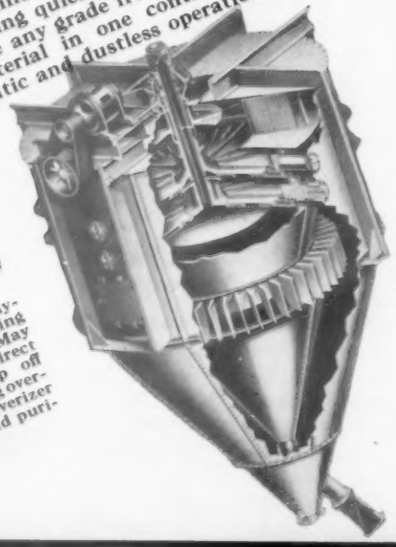

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WHY PREHEATERS FOR ROTARY LIME KILNS?

By THERON C. TAYLER

LAY several steel plates on the surface of the snow. The sun shines upon them; the rays of radiant heat from the sun are absorbed by the plates; the snow under the plates melts slowly; the plates sink below the level of the surrounding snow. They sink most rapidly when the sun is directly overhead and the rays are normal to the plate surfaces.

The flame in a rotary kiln radiates heat just like the sun. The heat radiates equally in all directions. Let us take a look into the average rotary lime kiln (Figure 1). The stone is rolling and sliding as a long ribbon confined to a 90-degree segment. One-quarter of the heat radiated from the flame falls upon the stone; the other three-quarters falls upon the lining.

When such a large portion of the heat of the flame goes to the brick, is it any wonder that rotary-kiln operators experience great difficulty in maintaining fire-brick linings? Is it any wonder that these linings soften and acquire adhesions known as rings?

Perhaps the depth of stone in the kiln could be increased. Maybe the kiln could be filled half full. Even then one-half of all the heat from the flame would go to the brick lining.

Let us go back to those plates on the snow. Suppose that some are black and others polished. The latter will absorb less heat than the former, possibly not enough to cause any snow to melt. These receive just as many heat rays as the black plates, but they reflect part just as a mirror reflects rays of light. A black steel plate may absorb 95 per cent. of the heat rays incident upon it and reflect the remaining 5 per cent.; polished, it may absorb only 10 per cent. and reflect 90 per cent.

Some materials are better reflectors than others. Fortunately for the makers and users of rotary kilns limestone is a good absorbent and unfortunately fire brick is not a good reflector.

There is little that the lime producer can do to make his stone absorb a greater part of the radiant heat incident upon it. He might, however, if he tried, find a kind or grade of fire brick with greater reflective capacity.

Why has so little interest been taken in this important phase of rotary-kiln lime burning?

Radiant heat rays fan out from their source and the radiant heat intensity falls off as the distance from the source increases. As the kiln diameter is increased the distance from flame to stone increases. There is, therefore, good reason to keep kiln diameters small.

Let us go back again to those steel plates on the snow. If one plate is shaded from the direct rays of the sun by any opaque object, even by a sheet of paper, it gets none of the heat ravs. So, in the kiln only the top surface of the top layer of stone receives radiant heat from the flame. The bottom surface of the bottom layer of stone receives radiant heat of somewhat less intensity from the hot fire brick. The gas movement over the top of the stone is so slow as to contribute a negligible amount of heat to the stone by convection. There is no gas-pressure differential to create any flow of gas through the bead of stone and no continuous path for conducting heat from the surface to the interior of the mass of stone in the kiln.

Let us assume that each stone in the kiln is round and 1½ inches in diameter. The top surface effective to the rays of radiant heat is not the sum of all the top hemispherical stone surfaces but is the sum of the projected areas. For an 8-foot kiln, 6½-foot diameter inside the liners, the chord AC (Figure 2) is 55 inches long. In a 1-foot length of kiln with stone spread to a width of 55 inches we have an area of 660 square inches of effective stone surface receiving heat from the flame. The arc ABC is 61 inches long and in a 1-foot length of kiln we have an area of 732 square inches of effective stone surface receiving somewhat less intense radiant heat from the brick lining. The total of all the effective stone surfaces receiving radiant heat is 1,392 square inches per foot of kiln length.

In this same 1-foot length of kiln there are 2,371 stones with an aggregate surface of 16,750 square inches. Thus, only 1,392/16,750, or 8.3 per cent., of the total stone surface is at any one time effective in receiving heat. Here is a challenge to those who advocate long kilns as a means of exposing more stone surface to radiant heat.

If all the stone surfaces are equally exposed to radiant heat, each small surface receives heat for only 8.3 per cent. of the time that it is in the kiln. Plants differ widely in the time that stone remains in the kiln. Let us assume 3 hours for burning 1½-inch stone. The surface of each stone would then have less than 15 minutes exposure to heat it from 60 degrees to calcination temperature and complete the calcination to a depth of ¾ inch.

Rapid heat transfer from the flame to the stone requires a substantial temperature difference. It is common practice to maintain a flame temperature of 2,400 degrees F. with a calcination temperature of 1,520 degrees and to have the gases leave the kiln at 1,250 degrees when the stone entrance temperature is 60 degrees. As long as such a waste-gas temperature is continued we can not hope for kiln efficiencies much above the usual 25 per cent. When high-temperature heat rays are applied for a few seconds only to a relatively cool stone they raise the surface temperature far above the core temperature. Intense heat causes rapid calcination at the surface while the core is still far below calcination temperature.

If with a flame temperature of 2,500

Figure 1.

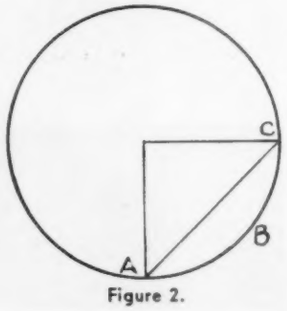

Figure 2.

degrees F. we allow gases at 2,000 degrees to be used to heat stone up to 1,520 degrees, then we are wasting

$$\frac{2{,}000 - 1{,}520}{2{,}500 - 1{,}520} = 49 \text{ per cent. of the fuel.}$$

This is known as the use of high-level heat for low-level work. It is using 49 per cent. more fuel to do heating for which waste heat is available but is not used because only 15 minutes is allowed for transferring the heat required for heating and calcining the stone.

A longer kiln, by giving more time for heating the stone to calcination temperature, would reduce the use of high-level heat for low-level work. An 8-foot by 100-foot kiln, with a nominal capacity of 75 tons per 24 hours as usually equipped, operates at about 25 per cent. thermal efficiency. If we increase its length to 300 feet, make no other changes, and retain its capacity at 75 tons, its efficiency will rise to about 35 per cent. The increased length makes a substantial saving in fuel. With an efficient cooler, kiln insulation, control instruments, etc., its capacity can be increased to 100 tons and its efficiency to 50 per cent.

A preheater should not be thought of as just another way to obtain the same effect as adding to the length of the kiln. It has many advantages which can not be matched by a kiln extension. Added to an 8-foot by 100-foot kiln, it should replace the entire stone-heating section so that the entire rotary becomes the calcining zone for the combination. The preheater may contain only as much stone as would be in 50 feet of rotary kiln length, but that stone exposes to the gases three times as much surface as would be exposed in a 200-foot addition to the kiln length. Such a small preheater is equivalent in heat-transfer surface to a 600-foot kiln extension, but might better be compared to two 300-foot sections which discharge a doubled load into one 100-foot rotary which is used for calcining only. The calcining zone of the original 8-foot by 100-foot kiln was less than 40 feet long; with the 300-foot length it is not over 60 feet; with the preheater it is 100 feet.

By a heat-soaking action before, or as, the stone passes from the preheater to the kiln it is assured that the center of each stone is heated very close to the calcination temperature by gases leaving the rotary at calcination temperature. Thus there is the minimum amount of high-level heat used for low-level work.

A preheater properly proportioned makes it practical to use the Eldred system efficiently. By this system gases at 1,520 degrees F. are extracted and returned to the burner to control the gas temperature and flame diameter throughout the rotary or calcination zone.

By increasing the flame diameter the flame is kept closer to the stone, thereby increasing the effective radiant-heat recovery. A longer flame with a lower peak temperature reduces brick maintenance, makes it practical to reduce heat loss through the shell by insulation, and to reduce ring formation with its attendant losses in production.

Unlike the long kiln which reduces the stack-gas temperature largely by increased heat losses through the shell, the preheater has almost no shell through which heat can escape. All the low-level heat goes to heating the stone. By doubling the flow of stone through the 8-foot by 100-foot zone the shell loss per ton of lime becomes only half as much as it was before the preheater was added and about one-quarter as much as for the 300-foot kiln.

By reduced temperature differences between the flame and the stone overburning is eliminated and a higher and more uniform quality of lime assured.

Important to many producers is the fact that a preheater can be added to an existing short and inefficient rotary kiln, and the unit will be doubled in capacity and made more efficient than the longest kiln built to date.

It is interesting to sum up the advantages of a preheater by considering the possibilities involved if we could cut an existing 8-foot by 300-foot kiln into three parts to make three 100-foot calcining zones, each to be provided with a preheater. Instead of 100 tons output per day we would have 600 tons per day. We would burn less coal per ton of output, have lower operating and maintenance costs, and better quality of product.

There are other industries which have made just as startling improvements. Some day when it has become common practice to operate rotary kilns at 75 per cent. efficiency we will look back on the older practice with some feeling of contempt and wonder that people could have been so wasteful of capital, labor and fuel resources.

Potash Industry Meets Domestic Requirements

The domestic potash industry, developed since World War I as a result of the acute shortage experienced at that time when the flow of potash from European sources was interrupted, functioned smoothly during 1940 and supplied all the potash needed to supplement such imports as continued to arrive and prevent any scarcity of salts for fertilizer and other uses, according to the Bureau of Mines. Although little if any importations from Europe may be expected in 1941, the industry is capable of meeting all domestic requirements, thus definitely removing potash from the category of strategic and critical materials, with which government stock-piling is concerned.

Production in the United States in 1940 of 658,249 short tons of processed or refined potash salts, containing approximately 379,679 tons of K_2O is shown by reports of producers to the Bureau of Mines. This represents a gain over 1939 of 20 per cent. in material produced and about 22 per cent. in K_2O. Sales of potash salts by the producers amounted to 677,892 tons, an increase of 7 per cent. over 1939, and contained about 393,058 tons of K_2O. The average K_2O content of the salts sold was slightly higher in 1940 (57.98 per cent.) than in 1939 (57.77 per cent.) with the increase a little more than 7 per cent. The value of the sales amounted to $12,562,050 or about 4 per cent. more than in 1939. Processed stocks held by producers amounted to about 35,000 tons, containing 16,000 tons of K_2O; stocks of crude mined material held were 37,000 tons, containing 8,000 tons of K_2O.

There was produced commercially in 1940, for the first time in the United States from domestic ores, sulphate of potash-magnesia, which has been regarded as indispensable to the fertilizer industry of this country and hitherto supplied by importations not now available. The production of sulphate of potash has increased noticeably in the last two years as has the production of high-grade muriate for the manufacture of chemicals. A small quantity of mixed salts is also included in the total figures. Operations near Carlsbad, New Mexico, which now furnish the largest part of the potash materials, are carried on by the Potash Company of America, United States Potash Company, Inc., and by the Union Potash & Chemical Company, which operated commercially for the first time in 1940. The latter company produces langbeinite from which the sulphate of potash- magnesia is made. Sylvinite is also produced at this mine.

The total crude ore mined in the Carlsbad region in 1940 was over 1,200,000 tons, and the refined and processed salts produced amounted to over 440,000 tons. An important production of potash salts is from the saline deposits at Trona, California, by the American Potash & Chemical Corporation, where they are obtained as co-product with borax, sodium carbonates, sodium sulphate lithium compounds, and bromine. There is also a production of potash from saline deposits at Wendover, Utah, by Bonneville, Ltd. Other potash salts are produced in connection with cement plant dust by the North American Cement Corporation at Security, Maryland, and from distillery waste by the United States Industrial Chemicals, Inc., Baltimore, Maryland.

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CHEMICAL LIME SPECIFICATIONS

By "ONLOOKER"

FOR a considerable number of years various departments of our Federal government, in coöperation with technical societies and private industry, have jointly and severally labored and at great expense to formulate and promulgate standard specifications for our nation's products, including chemical or industrial lime.

There is no doubt that these standard specifications are essential to our present economy and in all industry. They protect the buyer and afford the manufacturer, a yardstick for measuring values and establishing uniformity. Too, they provide a definite challenge looking to the technological advancement of our products. Standard specifications have been written for lime covering its use in plaster, mortar, as an admixture in concrete and are all-inclusive. They aid good workmanship in producing sound, safe, industrial and commercial and private dwelling construction. The producer, contractor and buyer all benefit by such standards. But can we say that these same standards, applied to chemical or industrial lime, are beneficial to the contracting parties?

There was a time when standard specifications for chemical or high-calcium lime stipulated that 90 per cent. available calcium oxide in fresh quicklime, or 90 per cent. available calcium hydroxide where the hydrate form was considered, should be interpreted as standards or units of value measurement. Lime manufacturers proceeded to guarantee these standards and quoted prices accordingly and with some degree of success.

What has transpired during these years of specification building? From the roaring 'twenties on through the 'thirties we have experienced the high and the low in our business cycle. There has been a gradual evolution into a higher plane. Products have been refined; specifications have become more rigid. Science and industry have thrown away their swaddling clothes. Technical developments in the laboratory stage only yesterday are practical matter-of-fact utilities to-day. This development, far-reaching and stretching the imagination of men, has brought about the demand and need for more stringent specifications covering chemical lime. This is all relative, it is true, but in this evolution what of the lime manufacturers as a unit?

Lime, the universal re-agent plentifully endowed to us by nature, is by its very origin a product of variables. High-calcium of merely calcium, high-magnesium or intermediate, these limes, even when comparable point for point, lend themselves to processes in dissimilar manner. Physical characteristics also vary as much as pebbles on a beach. Selection of the raw stone and subsequently after burning do help to produce limes of chemical and physical uniformity. Control of combustion factors likewise aid in producing this desired constancy of quality, but we still must contend with other variables somewhat intangible, but at the same time definitely influencing the character and quality of the finished product. These are problems which are best left to our combustion engineers and technicians who are even now wrestling with theories and practices.

In the meantime to what avail is such progress as is already indicated? *ABC* represent a group of lime manufacturers supplying the chemical market. *D* represents an important buyer or a group of individual buyers in the municipal or industrial field. Their lime requirements from a tonnage standpoint are large and desirable to the producers. *D* as the buyer is cognizant of this fact and immediately sets out to establish his own lime specifications. Naturally he desires the best the market affords at the least cost. He is deluged with analyses, samples, promises. Collectively, this may form the basis of his special or individual lime specifications and he proceeds along lines which will assure him of a lime which will provide the highest proportion of calcium or magnesium and the least of the inherent impurities.

Each of the manufacturers comprising group *ABC* wants the buyer's business for his very own and he immediately proceeds to prove it by offering the finest product at the best or lowest price, and he who bids feels that he must meet all competition or beat it. Technical development? Control of product? Well, yes, it is all included in the delivered price. The contract is awarded for the best lime at the lowest price.

Almost daily new specifications are being written and revised — specifications more rigid than heretofore, designed solely to benefit only the buyer. For the most part such specifications are accepted by the lime industry without qualms. While other industries capitalize on research and new developments, the lime fraternity is content to let the buyer write his own specifications and, in a sense, dictate the price he is willing to pay for its products.

If a product or service is worthy of its price, certainly lime, because of its inherent value, is a product which should be marketed at a price fair to both contracting parties and commensurate with the value given. The lime manufacturer should sit in his own saddle and it behooves him to have a hand in fixing the specifications of the product he sells, at a price which will insure the customer of receiving a square deal. In so doing he fosters good business and national unity. Will the manufacturer of chemical lime be equal to such responsibility? I believe he can and will be and opportunity is knocking right now.

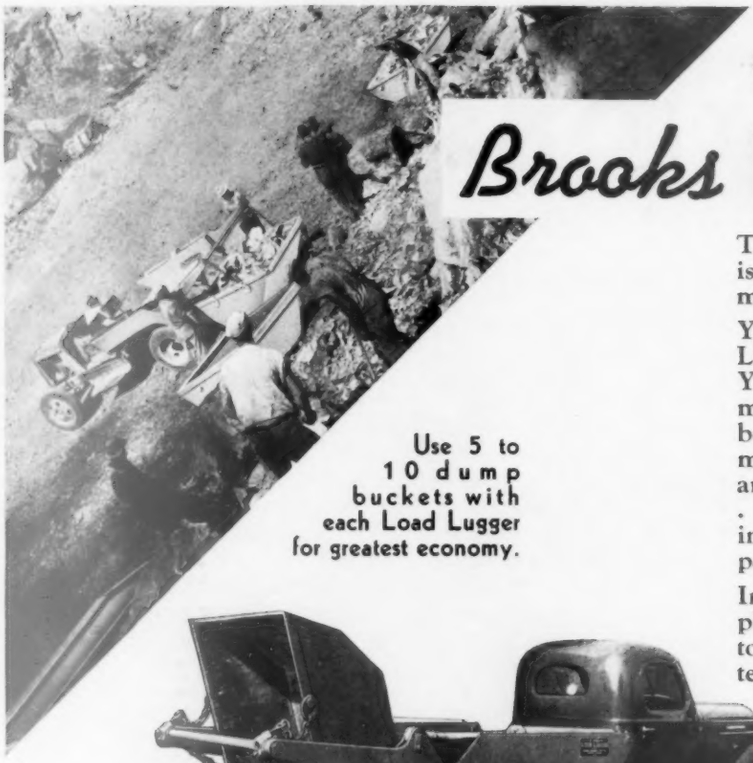
New Laws (from page 59)

establish a department of mineral resources. The department would have been charged with assisting in development of all the state's mineral resources, with the exception of coal, oil and gas, by finding interested capital for operations, giving publicity to New Mexico minerals, and by assisting prospectors and operators with the solution of their economic problems.

Other bills killed sought to give preference to New Mexico products in purchases by state agencies and departments, and to abolish the load limit for vehicles transporting minerals produced in the state.

New York.—Three bills affecting the industry were passed on the last day of the session. They were transmitted to the governor, who must approve them by May 3 or they will be dead.

The bills would authorize towns in Nassau County to enact ordinances for licensing and otherwise regulating sand or gravel pits, stone quarries, the removal of top soil or other excavations; would authorize the industrial commissioner to issue licenses for the sale of blasting explosives and to prescribe rules for the construction of magazines used for their storage requiring that they shall be fireproof, weatherproof and bulletproof; and would provide that machinery shall be equipped with hoods and pipes to remove dust or impurities when created in quantities tending to injure the health of employees, permitting the industrial board to adopt rules excepting any machinery if the apparatus is unnecessary or other means of protection may be provided.



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Use of Brooks Load Lugger for dumping rock direct to crusher, insuring continuous feed and maximum output.

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We have obtained very satisfactory service from our Load Lugger mounted on a Ford V8 truck. We prefer it to dump trucks. We load and sort by hand, and in our method of operation, the use of additional buckets is an advantage. We are using seven buckets to one unit. (*Name on request.*)

Ask about Special Introductory Offer of a two weeks' trial of the Load Lugger.

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North Dakota.—Final approval was given bills reserving for the state 50 per cent. of the interest in oil, natural gas or minerals found on state lands, and the same amount found on county lands for counties.

Also approved and signed by the governor was a bill authorizing dismantling of the penitentiary brick plant.

A bill seeking to provide that the state minimum-wage department may bring legal action to collect claims for employees, with employers to pay the court costs, failed to pass.

Ohio.—The house passed and sent to the senate a bill to remove the prohibition against using portable machinery employing gasoline or fuel oil for fuel in operations involving clay, limestone and shale. The present statute prohibits use of such engines in all mining operations.

The house also passed, by a 111 to 0 vote, a bill to create a natural resources coördinating board to provide for coöperation between departments and agencies, and to assemble and disseminate information on the natural resources of the state. It was sent to the senate for concurrence.

Oklahoma. — Both houses approved and sent to the governor for his signature a bill to regulate the manufacture, sale, distribution, use and possession of explosives.

The house passed and sent to the senate a bill to extend the workmen's compensation law to cover occupational diseases, and killed a bill to allow counties to purchase road materials without competitive bidding when the purchase is less than $2,500.

A new house bill, referred to the committee on penal institutions, would authorize state construction and operation of a cement plant at the Stringtown prison.

Oregon.—The senate passed, over the governor's veto, a bill to encourage the use of industrial and building material produced in the state. It provides that the contractor give preference to Oregon-produced cement, sand, crushed rock, gravel or plaster for public buildings "where the bid prices of such materials are no greater than those of similar materials produced outside of Oregon."

Both houses approved a bill authorizing the removal of gravel, rock, sand, silt or other material from the beds of navigable streams.

Pennsylvania. — The senate passed and sent to the house for concurrence a bill to appropriate $125,000 to Pennsylvania State College for research in state mineral resources. It provides that $75,000 be spent during the next two years for "research and investigations of long-range basic problems affecting the mineral industries of the commonwealth," with an additional $50,000 to match money contributed by industry.

A house bill, referred to the committee on workmen's compensation, would provide compensation for partial disability due to silicosis, anthraco-silicosis or asbestosis.

Rhode Island.—The house passed a bill to regulate the manufacture, sale, distribution, use and possession of explosives, and a measure to provide for an investigation of accidents and occupational diseases and their causes, for the determination and establishment of safety codes for the purpose of preventing such accidents and diseases. Both were referred to senate committees.

Utah.—The governor signed a bill to make occupational diseases compensable. The measure was drawn by a special committee of employers and employees under authorization of the 1939 legislature.

Both houses approved bills to provide for the sale of state-owned farm lands without mineral reservations; and to make unlawful the removal of minerals and timber from state lands.

West Virginia.—Bills that failed to pass included measures to regulate the manufacture, distribution and possession of explosives, and to cover the fraudulent purchase and sale of used machinery and metallic materials.

Wisconsin.—The assembly killed a bill for a state cement plant.

The senate passed and sent to the assembly a bill to regulate the manufacture, sale, distribution, use and possession of explosives.

New Cement Company Organized in Mexico

A group of Mexico City banking interests, headed by J. Lacaud y Cia., have recently organized a cement company with an initial capital of $1,600,000 (Mexican currency), and Cementos Guadalajara, S. A., has recently been formed to build a cement plant at Guadalajara, state of Jalisco, Mexico.

A two-kiln plant will be erected, and provisions will be made to allow for further increase in capacity later. All machinery is being purchased in the United States. Clay and other siliceous cement-making materials are found on the plant site, and limestone will be brought in by rail from the company's quarry situated about 60 kilometers from the plant.

Special and masonry cements will be produced in the Guadalajara plant under the Blank Process, and licenses have been granted the Guadalajara company by the Cement Process Corporation, New York. This is the first cement company to be organized in Mexico during recent years.

Contracts for the design, installation and operation of the Guadalajara plant have been awarded Alton J. Blank, executive vice-president in charge of operations of Cementos Atoyac, S. A., who is also the chemical director of the Cement Process Corporation, New York, and to Charles C. Jagou, consulting engineer of the Cement Process Corporation. W. B. Williams, chief engineer of Cementos Atoyac, will be superintendent in charge of construction at Guadalajara. It is expected that operations of the Guadalajara plant will commence early in 1942.

Acquires Property of Cementos Atoyac

Cementos Atoyac, S. A., with plant at Puebla, Mexico, recently acquired the property of Cementos Indio, S. A., a small wet-process cement plant situated adjacent to the Atoyac plant. The plant was built a number of years ago to produce Portland cement by the wet process from a marl deposit on the plant site but, having consumed the small deposit of marl, has not operated during the past several years. The Atoyac company will utilize the Indio plant in the production of its new masonry cement, which is being marketed under the trade name "Caloyac."

The Atoyac company formerly produced "Caloyac" in its main plant which will now be dedicated exclusively to the production of its pozzuolan, high-silica cement "Atoyac," and its initial masonry cement "Plastocement." All three of these special cements are produced under the Blank Process through license from the Cement Process Corporation, New York. The Indio plant will be operated by the Atoyac organization. F. J. Miller is president and general manager, and Alton J. Blank is executive vice-president in charge of operations.

"Mac's so fast with that new shovel he marooned a coupl'a spectators before they could back up!" (Reproduced from the AMSCO BULLETIN.)

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Crushers get the

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★ **For PRODUCTION** . . . they will outrange any crusher, weight for weight, and will deliver **continuous,** top-tonnage figures—10 to 100 tons per hour. Completely effective for reducing limestone, burnt lime, dolomite, gypsum, shale, clay, barytes, etc.

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CONTINUOUS LIME KILN
HYDRATORS & HYDRATE PLANTS

Production and profits in lime and hydrate plants just naturally zoom to a new "ceiling" when you install the York-Kuntz patented kiln.

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William J. Kuntz, Pres.

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TO ALL DEFENSE WORKERS . . .

The President of the United States said:

"I APPEAL

"to the owners of plants
"to the managers
"to the workers
"to our own Government employees

"to put every ounce of effort into producing these munitions swiftly and without stint. And with this appeal I give you the pledge that all of us who are officers of your Government will devote ourselves to the same wholehearted extent to the great task which lies ahead.

"We must be the great arsenal of democracy. For us this is an emergency as serious as war itself. We must apply ourselves to our task with the same resolution, the same sense of urgency, the same spirit of patriotism and sacrifice as we would show were we at war."

Let's get squarely behind our President's appeal. Let's work together building that "GREAT ARSENAL OF DEMOCRACY" in record time. Increase PRODUCTION! That's our No. 1 job! Let's go!

Lime Industry Copes With NATIONAL DEFENSE

"Butch" and "Bill" Discuss the New Problems in the Present Emergency

DEAR BILL:

A letter from you, during these busy times, is greatly appreciated. I should have replied long since, but, with the days and nights crowded with work, and a mind choked with many things to be done, I find it difficult, even for one who is intimately associated with the Industry, to outline, as you request, my thoughts concerning the production of lime in the present national emergency.

It is hardly necessary to mention that since 1929, in common with most enterprise, the lime industry has had a troublesome time. Beset with internal strife, a none-too-potent national organization, inroads by more alert manufacturers of substitute products, labor difficulties, weak markets, non-aggressiveness, high taxes, etc., the industry, seldom profitable, finds itself, like the nation generally, in a state of unpreparedness. In its weakness it is forced to call for higher prices for its products. With the restoration of an inter-industry trust firm prices might be obtainable, but higher prices for lime products are remote, to say the least. Therefore, we must find the answer within ourselves.

Bill, you will no doubt recall the good old days, even before mechanical loading in quarries was thought of, when the one-man stone went to the upright kilns or to cars, as flux for the open-hearth furnaces. Then what we forked from the quarry floor went to the blast-furnaces. Those were the days—nothing wasted. Then, do you remember when the steel companies began to insist that all blast-furnace stone be passed over a ¾-inch screen? Well, we rigged up old revolving scalpers, and we took out the minus ¾ but we didn't get any more money for our furnace stone, and we had a product left on our hands that we did not know what to do with, and, to our everlasting shame, we have never found out. This was the beginning of the complexity, which, with increasing intensity, has been the constant unwelcome companion of most lime salesmen and operators.

As consumers of chemical lime and limestone observed through experience that more impurities occurred in the smaller particles than in the larger sizes, the specifications became more and more rigid until it became necessary to remove everything below 2½ inches. Do you recall, Bill, how the stock-piles of the objectionable smaller sizes assumed mountainous proportions—every ton of it with the same unit inventory value as the ton of material which reached a market? We weren't very particular about the stripping phase of our operation then, and when it rained, our stock-piles took on a kind of "golden hue." Rather than wash it, we tried to explain to the highway engineers (our only outlet) how that "little bit of clay" served as a binder. They would not believe us, and the next thing we knew we had installed wet plants and were washing the stone. This did not help the general scheme of things either.

The point I am trying to make, Bill, is that, little by little, slowly but surely, progress was crowding us into a corner from which there seemed to be no escape. At least, we never did very much about it. Of course, we tried to dispose of our by-products, but every outlet we could find was seasonal in character, and very limited in its ability to assimilate our increasing output of "off-falls." Naturally, competition for these markets was keen and prices approached the vanishing point. Furthermore, seasonal disposal, as in the case of lime or pulverized-stone products, entailed storage facilities. Do you remember how, at first, we tried storing our grade "B" products through the winter in bags? Well, the floors of the old shed gave way, the roofs leaked, the bag damage was terrific, customer dissatisfaction was great, and, after a few years of that, we came to the conclusion that the only fellow to profit by this procedure was the paper-bag manufacturer. As far as we were concerned, for every ton of material handled in this way, we experienced a one-dollar loss. A lot of them still try it, Bill, but, with a cheap commodity, it can not be done successfully.

Bulk storage seemed to offer possibilities, but it cost at least $10 per ton. Even if we had had the money, this figure was hard to justify for $6 and $7 lime, and impossible for $2 and $3 pulverized lime-stone, so, in indecision, we drifted. To-day, the problem is no nearer to solution than it was twenty-five years ago. I've often thought, Bill, if we had taken a few of the thousands of dollars we wasted in trying to store our products in paper bags, and used them to create a fellowship in one or more of the fine technical institutes about the country, we would undoubtedly have solved our problem of by-products years ago.

Speaking of yesteryears, Bill, do you remember when the limestone-screening problem became so acute, how we were going to wet grind in a big tube-mill, and later nodulize it in a reducing atmosphere? Do you remember how they scared us off, saying we were crazy? Well, I'm not so sure we didn't miss the boat when we abandoned that idea. Our plan was undoubtedly crude, but refinements would have followed with experience, and many of the woes that hang as a heavy wet blanket over the lime industry to-day would not be present.

Bill, do you remember those first rotary kilns for the burning of lime? Your father said they would never work. He was terribly mistaken, Bill. They have worked so well that the market has been revolutionized. It is almost impossible to sell lime to-day unless it is a product of a rotary kiln. These kilns to-day are practically automatic, and the material that emerges does not look like lime; at least, not lime as you and I first remember it. It looks more like marshmallow candy, good enough to eat. Its size is regular, its quality constant, and a ton of it can be burned with 320 pounds of coal. It was only a few years ago that 800 pounds of coal was required to do the same amount of work. I am looking forward to the day, Bill, and I do not expect it to be very far distant, when a thermal efficiency of 8 parts of lime to 1 part of coal will be realized.

Of course, I am particularly happy to write you about rotary kilns, because I have had a part in their development. I could write endlessly about them, Bill. While that tech-

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What you don't know ~~won't~~ will hurt you

Above: EASTON TR-15H Semi-Trailer. Average payload 22-25 tons. Hydraulic body hoist optional. Two other sizes.

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You may not be considering the immediate purchase of new equipment. Even so, it pays to *know* costs. An EASTON Quarry Transportation Survey will cost you nothing, will give you down-to-the-penny facts on cost-per-ton, based on recommended new equipment.

An EASTON SURVEY gets all the facts!

The EASTON Survey provides you with an accurately scaled map of your quarry, including haulage routes, location of shovels, crusher, etc. With this map is a tabular analysis of routes, equipment and capacity; a detailed time-and-cost study; and a summary of investments and depreciating periods based upon the most practical type of equipment for your service.

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Like most manufacturers we are working against an abnormal backlog. *Our sales engineers have more time to give to survey.* It is an opportunity for you!

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A letter from you, now, will help us plan spring field trips to include your quarry. This service incurs no obligation on your part. Write today . . .

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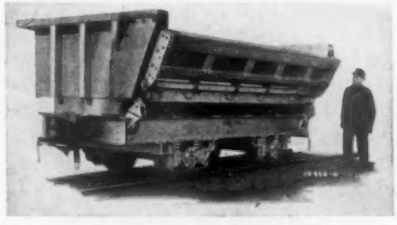

Above: EASTON Won Way Car. Below: EASTON Cornwall Car. Both have automatic down-folding door, Timken bearings.

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TWENTY-FIVE YEARS OF SERVICE TO THE QUARRY INDUSTRY

nique is largely responsible for much of the first-quality lime that is being shipped to the discriminating chemical markets to-day, it has not, by any stretch of the imagination, solved the problems of by-products, which loom just as foreboding on the horizon as ever. Bill, let me digress long enough to make a point: the fellow who produces lime in a rotary kiln, is the only one, employing this type of equipment, who has a by-product on the raw and finished side as well. The cement manufacturer pulverizes his raw product, and (with admixtures, of course) injects it, in its entirety, into the kiln. On the finished side the treatment is much the same. The entire output of the kiln reaches the consumer in the form of a grade "A" product. The same is largely true of refractory dolomite, magnesite, and other related materials. This is far from the case of the lime manufacturer.

1. He blasts the rock from its original state, and, as he reduces it by various stages to a suitable size for calcining in a rotary kiln, he acquires, in every phase of the reduction, a small percentage of fines, which, in total, usually average about 20 per cent. of his entire production. These fines, or screenings, under the present system must be disposed of on a seasonal market at prices ordinarily far below the cost of production.

2. During the process of calcination, the presence of moisture in the stone, and attrition therein, and subsequent handling, account for as high as 30 per cent. of the kiln output. In most instances that portion of the lime has to be disposed of in markets that are seasonal, and often at greatly reduced prices. There are occasions when it is even necessary to waste it. Lime in its caustic form weighs approximately 60 pounds per cubic foot and in the hydrated state about 25 pounds per cubic foot. Consequently, bulk or package storage is prohibitive, and, in some cases, dangerous.

Thus, you will note, Bill, that I have accounted for by-products on both the raw and finished side in the production of lime. We should have analyzed this condition years ago, and, had we done so, we would probably have cleared the atmosphere on the raw side by a form of nodulizing, and, on the finished side, by briquetting. This latter process holds tremendous possibilities, minimizing the basic complexity, which now accompanies the processing of lime.

I note from your letter, Bill, that lime producers in your district are staggering under the requirements of the present defense program. With a very few exceptions this is true throughout the length and breadth of the country. Within the past five years approximately 2,000 tons of daily production has been added to the nation's output of rotary-kiln lime. Assuming that there has been no further dismantling of vertical kilns, the industry is in the strongest position in its history to meet the demands of the rearmament program. It is doubtful if even the top productive capacity will be sufficient for requirements. Under normal conditions the industry has a productive capacity far beyond the consumptive ability of the chemical and metallurgical industries. Therefore, lime producers—a far from prosperous group—will be wisely cautious about expanding their plants. The only approach for a program of this character would be through the construction of absolutely modern equipment, which would produce more of a better product at less cost. Then, in the post-war period, the obsolete equipment would be placed in reserve, while the new installations would be in position to meet the worst competition in history, which is bound to follow the present sellers' market. Of course, the joker in this plan is the ability to purchase and get delivery of necessary materials in time to be of benefit. A drop in demand, during such a transition period, would be disastrous.

Other possibilities for expanding production, to correspond to the temporary demand, would be the briquetting of the fine sizes of caustic lime. Such an accomplishment would, in addition to correcting many of the existing ills of the industry, add approximately 20 per cent. to its present productive capacity. I am of the opinion, Bill, that, with this additional tonnage, no further worries of meeting the demand would be necessary.

Failing in either or both of the foregoing, it might be desirable to discontinue the construction of concrete roads for a time. By so doing, certain strategically located cement kilns might be pressed into the production of more essential lime.

All these plans are, of course, predicated on the ability of the railroads to furnish cars and haul the tonnage. At the moment, it appears that transportation facilities will break down before the industry will be able to produce enough lime to meet the demand.

I hope, Bill, you will pardon the long discourse on the lime industry in the present national emergency. If you have any suggestions along this line, you might send them to the Editor.

With best regards to you and yours, I am, cordially,

"Butch."

"From a Bucket-load to a Carload"

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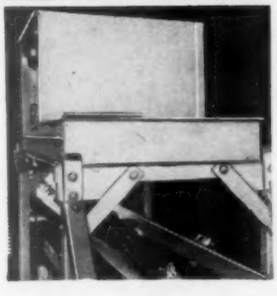
WEIGHTOMETER • For Weighing in Transit



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It always heads the "required machinery list" of experienced operators who are handling crushed stone, ores, coal or any bulk materials by belt conveyor.

"Weightometer" is applicable to both inclined and horizontal conveyors.

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"Feedoweight" is a conveyor type feeder which automatically weighs, registers and uniformly feeds material by weight. Correctly proportions two or more materials. For batch or continuous proportioning.

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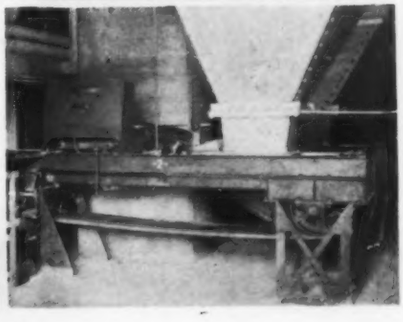

Merrick Scale Mfg. Co.
Passaic, New Jersey

KENNEDY STONE PREHEATER AND DEHEATER

Saves in Lime Production

40% SAVINGS IN FUEL
20% INCREASE IN CAPACITY

Plus
A Better Product!

It has been known for many years that better lime could be made in rotary kilns than in vertical kilns, but at a considerable handicap in price.

The great length of former types of rotary kilns, sometimes exceeding 400 feet, has failed to solve the problem of efficiently reducing the temperature of the exit gases.

Now, thanks to the KENNEDY principle of preheating and deheating, it is possible to make a high-grade lime of better quality than was formerly obtainable, in kilns less than 150 feet long.

This principle permits the effective recovery and use of the exit gases, and in actual operation has shown 40% saving in fuel, with capacity increased 20% and more.

Short kilns employing the KENNEDY method also acquire an internal glaze which lessens the wear on kiln liners, lowers the power requirements, and reduces the formation of kiln rings.

Overburned and underburned lime is practically eliminated. Coal feed and lime calcination are switchboard controlled.

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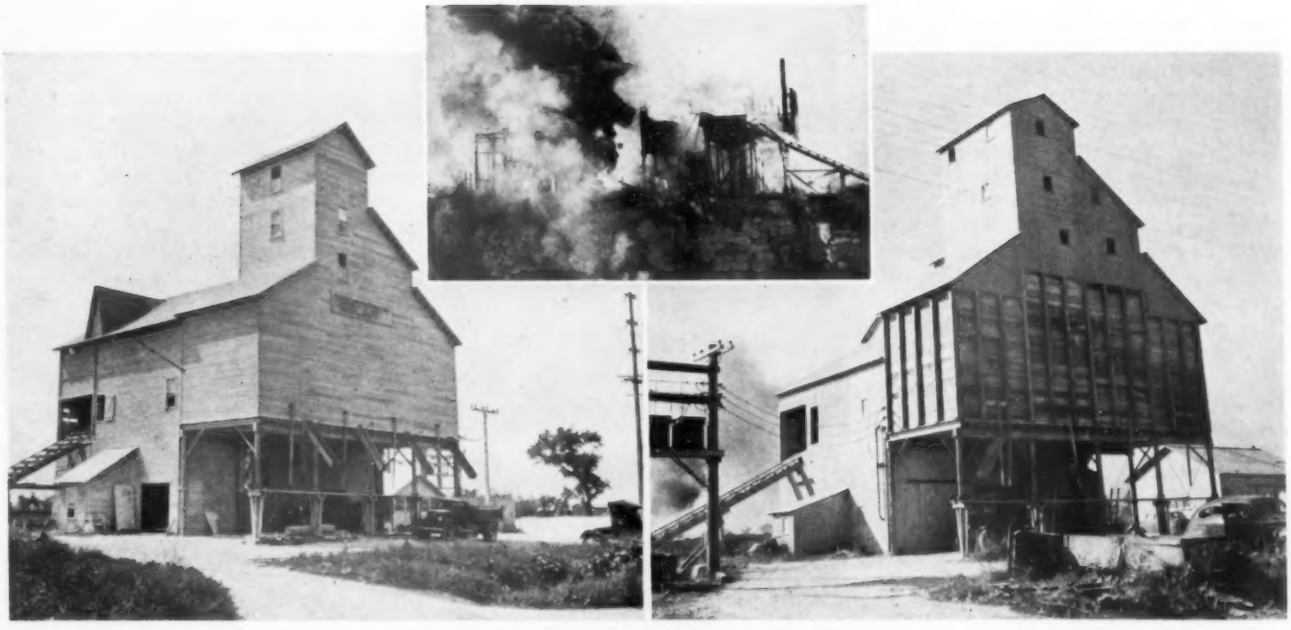


The plant of the Morris Limestone Products Company before, during and after the fire which burned it to the ground on October 17, 1938. Note the similarity in appearance of the new plant, at right, to the original plant, left.

NEW STONE PLANT IS ALMOST AN EXACT DUPLICATE OF ONE DESTROYED BY FIRE

USUALLY when a producer suffers the loss of a plant through fire or other calamity and replaces it with a new plant, he builds it in conformity with an entirely different design which eliminates things he disliked about his original plant. When the new plant is practically a duplicate of the old one, it is evident that the old plant must have been quite satisfactory. This seems to have been the case with the Morris Limestone Products Company of Morris, Illinois. On October 17, 1938, its plant near Morris burned to the ground, destroying all the equipment except the crushers and an incline hoist. The loss, estimated at about $30,000, was only partly covered by insurance. The new plant was built on the same foundations and went into operation in May 1939. In outward appearance it differs little from the original plant except that it has corrugated-metal siding and roofing where wood was used on the old plant.

The original plant was built in 1938 and was intended primarily for the production of aggregates. In 1930 the growing demand for agricultural limestone was responsible for the installation of an Allis-Chalmers Pulverator. In February 1938 the original secondary crusher was replaced by a Traylor TY gyratory crusher in order to make possible more efficient production of the smaller-sized aggregates, which were becoming more popular, and at the same time to increase the output of agricultural limestone.

The skip car discharging a load of stone into the primary crusher.

The deposit is limestone in a stratified and rather broken horizontal formation. The working face is now nearly straight for a distance of about 700 feet. The drilling is done with a Loomis Clipper well-drill. Trojan 40 and 50 per cent. explosives are used. A recent shot of 34 holes in a single row brought down about 15,000 tons of stone. Secondary drilling is done with a Gardner-Denver 545 jackhammer, the air for which is supplied by an Ingersoll-Rand compressor mounted on a truck. The quarry is drained from a sump by a Barnes Size 4 self-priming centrifugal pump, which is driven by a Hercules Model 9 gasoline engine. A small electrically-driven centrifugal pump is also used.

A 1-cubic yard steam shovel formerly loaded the stone into 4-ton end-dump cars hauled by an 8-ton gasoline locomotive. These cars were hauled up an incline one at a time to be emptied into the primary crusher. In 1936 the locomotive and cars were replaced by two Mack trucks and one of the cars is now used on the incline. The trucks are loaded to the capacity of the car and unload into it from a ramp. According to T. W. Shaw, president of the company, the use of trucks has increased the capacity and reduced quarrying costs and has also cut down the amount of tramp iron in the stone.

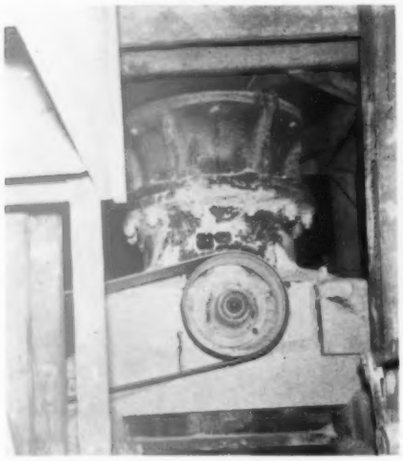
Before the fire the Allis-Chalmers 1-drum incline hoist was on the second floor of the plant. It is now on the ground floor on concrete foundations and has been equipped with a v-belt drive. At the top of the incline, above the primary crusher, the track is inclined sharply. This arrangement tilts

By W. E. TRAUFFER

the car at the same time that a sliding-rail lifts its end gate, discharging the stone into the Allis-Chalmers No. 9 Gates primary gyratory crusher. A Sasgen hand-operated hoist operates the hook used to dislodge stone in the crusher.

The minus 3-inch stone from the primary crusher is carried by a belt-bucket elevator to a 4- by 6-foot Stephens-Adamson 2-deck vibrating screen equipped with Twin City wire-cloth. The plus 1½-inch stone passing over the top deck of this screen goes into the Traylor 2-foot 4-inch TY gyratory crusher which reduces it to ¾-inch size and under. The above-mentioned elevator returns this material to the screen.

The ¾-to 1½-inch stone coming off the bottom deck of this screen goes to a bin compartment from which it can either be loaded into trucks or fed to the Allis-Chalmers No. 2 Pulverator to be made into agricultural limestone. A



The secondary gyratory crusher which reduces stone to ¾-inch size and under.

bucket-elevator feeds this product into another bin compartment.

The minus ¾-inch stone dropping through the bottom deck of the screen can be discharged into another bin compartment to be used for traffic-bound

Truck being loaded with sized stone from one of the stock-piles.

The hammer-mill which makes agricultural limestone from ¾- to ½-inch stone.

roads. When clean crushed-stone aggregate is desired, this ¾-inch stone is discharged from the first screen over a 3½- by 8-foot Universal 2-deck vibrating screen. Usually ⅜- and ¼-inch wire cloth is used to make two sizes of stone which go into separate bin compartments. The screenings falling through the bottom deck also go to storage.

The vibrating screen used to make two sizes of crushed-stone aggregate.

The old steel bin supports and floor girders and their concrete footings were not damaged by the fire and the new bin structures and part of the plant were built on them. The new wooden bins have a total capacity of 500 tons.

All shipments are made in trucks which are weighed on a Fairbanks-Morse truck-scale at the plant office.

The present plant capacity is about 500 tons in 8 hours, of which about 175 tons is agricultural limestone. The pulverizer is usually operated an additional 4 hours at the end of the day to produce another 75 tons of agricultural limestone. An attempt is made to build up a stock-pile of at least 20,000 tons of this material ahead of the season's demand.

About 5,000 tons of other types of stone is also stock-piled. Trucks are used to do the stock-piling, and reloading into trucks for shipment is done by a Haiss stock-pile loader.

Tompkins (from page 38)

away we go at 50 miles an hour, with Ralph Barrows, who created the assembly, sitting on an empty dynamite box and doing the steering.

Another interesting and unusual piece of equipment that serves both the quarry and the road-building machinery is an oil, gas, tire, battery and motor servicing truck. This is another Ford V-8, and here's what it carries regularly: 500 pounds of grease, 300 gallons of gasoline, 200 gallons of Diesel oil, 30 gallons of lubricating oil in 6 different grades, 1 gallon of distilled water for batteries, 1 air-compressor, 1 tire-pump, 1 grease-pump, 1 set of tire tools, 1 set of emergency automobile and truck and Diesel-engine repair tools, 1 tire-gage, 1 floodlight, 2 buckets, 3 lines of oil and gasoline hose, 1 drum for drained-out crankcase oil, and 1 first-aid kit.

The driver of this carry-all, Dean Elliott, is kept busy all day long servicing shovels, trucks, tractors, clam-shells, etc., so they need not come in to a central point for fuel, lubrication or minor repairs.

Crankcase oil from the shovels, trucks, tractors, etc., is reclaimed in a B-25 Bucyrus-Erie "Master Filter," with decided economies, according to Tompkins. Oil changes are made more frequently in the various pieces of equipment, with consequent reduction in internal wear, because plenty of good reclaimed oil is always available, although there is nothing stingy about the way new oil is used.

Drums of new and reclaimed oil are carefully distinguished from each other by means of metal disks, on which the viscosity number and the letters "N," "R" or "U" are painted to indicate whether the oil is new, reclaimed or used and waiting reclamation in the filter. The metal disks are attached to spring clothespins and clipped on the storage drums.

William Gardner is superintendent for Robert E. Tompkins; A. E. Tower is office manager; E. M. Crowley is paymaster; Robert Dibble is weighmaster and timekeeper; Clifford "Tex" Brown is powderman; and Francis Colton operates the 37-B Bucyrus-Erie shovel. Some of the foregoing are responsible for various features of the highway work, as well as the operation of the quarry, but 17 men are kept busy at the quarry for 10 hours a day.

The George Haiss Manufacturing Company, Inc., announces the appointment of new distributors for its products, as follows: Nixon-Hasselle Company, Chattanooga; Victor L. Phillips Company, Kansas City; Drott Tractor Company, Milwaukee.

Rebuilds Salt Lake City Plant to Reduce Cost of Production

The new plant of the Utah Sand & Gravel Products Company. The old plant may be seen in the background at the right.

THE Utah Sand & Gravel Products Company of Salt Lake City, Utah, has carried on an extensive improvement and expansion program for the past several years. The result is a group of modern and efficient plants which not many producers in any section of the country can duplicate. This program began several years ago when a modern sand-and-gravel plant was built at San Pass, Nevada, to supply ballast for a transcontinental railroad. Late in 1940 the company put in operation near Evanston, Wyoming, a new sand-and-gravel plant which might be said to be the last word in ballast plants. This 650-ton per hour operation was described in detail in the January, 1941 issue of PIT AND QUARRY. Early in 1938 a new plant of unusual design was built in Salt Lake City for batching into truck-mixers.

The latest step was the rebuilding, during the winter just passed, of the old Stauffer plant, which for many years had supplied a large proportion of the aggregates used in Salt Lake City and its vicinity. Actually this is now a new plant as only the bins and a few minor pieces of equipment were retained from the old plant. Except for these bins the plant is built entirely of steel and concrete. During this construction the wooden bins were raised with jacks while a concrete floor and posts were poured under them. The new plant lay-out was designed by the Los Angeles branch of the Stephens-Adamson Manufacturing Company which also supplied most of the new equipment. It was designed to make possible the production of any desired sizes of gravel. Its capacity varies from 100 to 200 tons per hour depending on the type of material being fed to it.

The Utah company's chief purpose in rebuilding this plant was to get lower production costs. The old Stauffer plant had become obsolete and the nearby Utah plant was 20 years old and its deposit had been worked out so far up the mountainside that it was becoming too expensive to operate. This plant was dismantled during the past winter.

The deposit near the new plant is at a much lower level, at the foot of the Wasatch Mountains, and can be excavated much more economically. Actually there are two deposits close together, one consisting of gravel with only about 40 per cent. sand, the other of sand with only about 30 per cent. of fine gravel. There is also a deposit of sound limestone which is not now being worked. The gravel is sound and clean; the sand contains less than 1 per cent. of silt and passes inspection for any use without being washed. The material from these two deposits can be fed to the plant either separately or together as demand requires.

Both deposits are worked from a single pit along the base of the mountain. In the end of the pit farthest from the plant a 3-cubic yard drag-scraper is used to bring the coarse material to a hopper. This scraper is operated by a 100-horsepower Thomas hoist. A Stephens-Adamson reciprocating feeder discharges this material on a 20-inch by 200-foot belt-conveyor, which carries it to the 20-inch by 860-foot main pit conveyor by which it is taken to the hopper of the main plant conveyor. About 300 feet from the feed end of the 860-foot conveyor is another 3-cubic yard scraper system which is used to feed sand to this system. Under this hopper is a Jeffrey-Traylor vibrating feeder.

The hopper into which the long field conveyor discharges can also be fed with material by a Caterpillar RD8 tractor equipped with a Le Tourneau bulldozer. This equipment is sometimes used to feed additional sand into the system when only the gravel scraper is in operation. There is also an occasional demand for clay-bound material for secondary roads and for shoul-

Tractor fitted with bulldozer feeding material to the hopper of the plant conveyor.

The coarse-sizing and two fine-sizing screens.

ders for paved roads. In this case the tractor is used to feed the 5- to 6-foot overburden into the hopper. This material is crushed to 1-inch size and under in the plant but is not washed because its clay content is desirable.

The 30-inch by 190-foot main conveyor feeds a 4- by 8-foot Tyler Niagara 2-deck screen, only the top deck of

The crushing station with oversize return conveyor at upper left.

which is now in use with 2½-inch openings. The oversize goes into a 15- by 24-inch Allis-Chalmers jaw crusher. The crusher product and the material falling through the screen are carried on a 30-inch by 185-foot belt-conveyor to a 4- by 8-foot Stephens-Adamson 2-deck screen. Various sizes of screen cloth are used on this screen, that on the top deck varying from 2- to 1¼-inch openings. Sometimes only one deck of this screen is used. When ordinary commercial sand and gravel are being produced 2-inch openings are used on the top deck and 1½-inch on the bottom deck. The oversize goes into a rock bin and the material passing over the bottom deck goes into another bin. The material passing through the bottom deck goes to two additional screens for final sizing. One is a Stephens-Adamson screen and the other a Tyler Niagara. Both are 4- by 8-foot, 2-deck machines. The products

Storage bins beneath the screening tower.

of these screens are discharged into the six-compartment, 750-ton laminated wooden bin, from which cars and trucks are loaded.

The oversize-rock compartment has a capacity of 200 tons. This rock can be discharged by a Stephens-Adamson belt-feeder on a 24-inch by 185-foot return belt-conveyor which drops it into a 3-foot Symons reduction cone crusher. The product of the crusher is taken by the main belt-conveyor to the screening tower.

Stephens-Adamson conveyor idlers and pulleys and Goodyear belting are used. All the conveyors have channel-iron frames supported on steel pipe bents which were welded in place. All the drives use Goodrich and Gates V-velts. Fairbanks-Morse and General Electric motors are used.

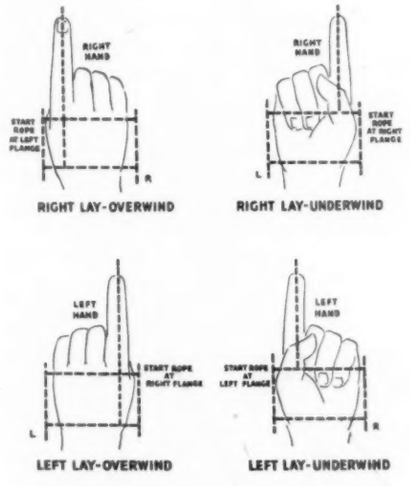
Drum Reeving Simplified by This Easy Method

There is a rule, a rather complicated one, that tells at which drum flange to start roping a smooth drum. If started at the proper flange the rope will wind with the wraps tightly hugging each other. It will so wind itself on the drum that there will be no space between wraps into which a wrap from the layer above might squeeze and cause serious scrubbing, scarfing or binding. If a rope is not to damage itself prematurely the wraps must lie close together.

To reduce the tendency for rope to spool unevenly, many users are employing the preformed type, since in the manufacture of this type of rope practically all internal torsional stresses are eliminated. One result of "preforming" is to make the rope resist rotating when passing over drums and sheaves as is common with non-preformed. This resistance to rotating, whipping, together with its freedom from "crankiness" allows performed rope to be spooled much better. However, regardless of the type of rope used, all ropes should be properly started on the drum. Here's the rule:

When a right-lay rope is being underwound on the drum (which is to say, it leads from the bottom of the drum) start it from the right flange, looking at the drum from the rear. If a left-lay rope, start it from the left flange. Conversely, if a right-lay rope is being overwound (that is, it leads from the top of the drum) start it from the left flange. If a left-lay rope (overwound) start it from the right flange.

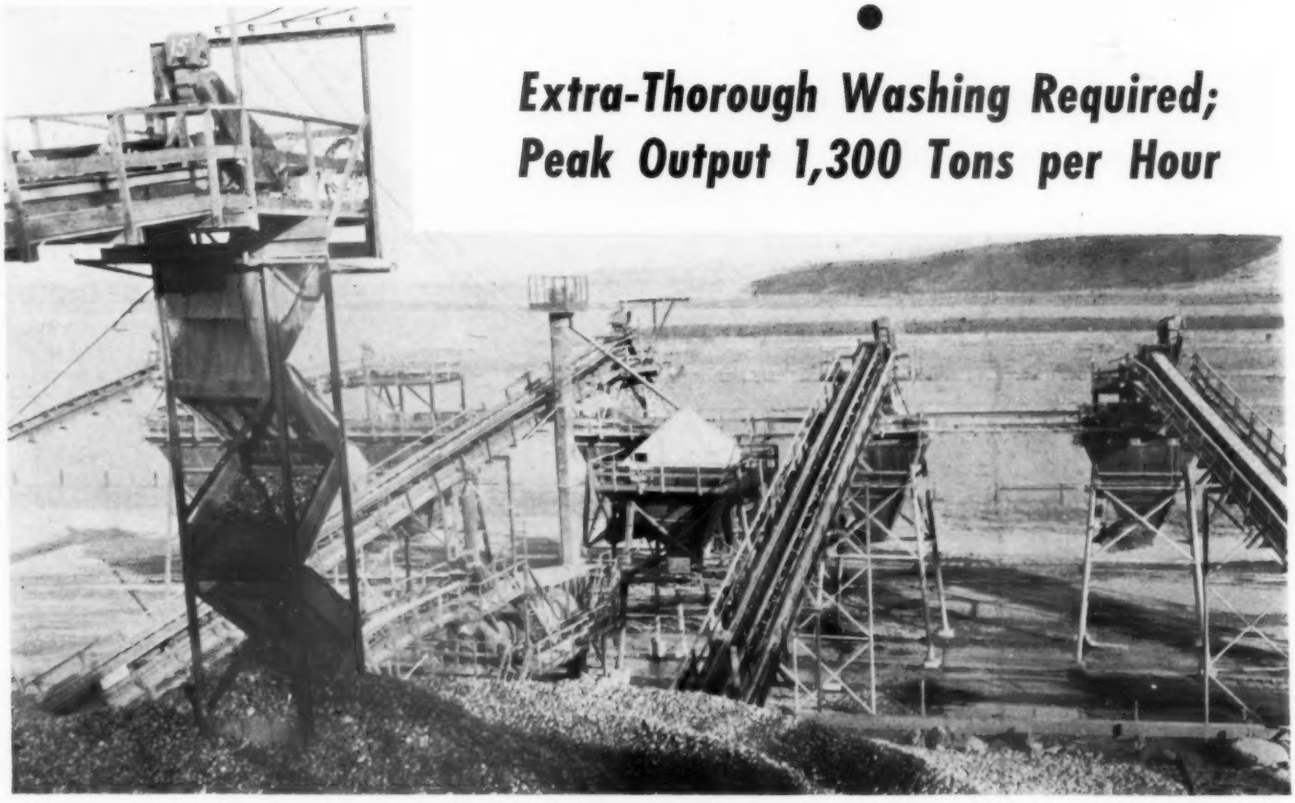
That's a complicated rule to remember, and more frequently than not quick reference to it can not be made at the machine. . . . So—here's a far simpler rule: using your doubled-up fist to represent the drum, and the index finger to indicate the flange. With right-lay rope use the right fist. With left lay rope use the left fist. For overwound rope keep your fist back up. For underwound rope, palm up. Pointed to the drum the index finger will indicate both how the rope should lead from the drum and from which flange. The accompanying illustrations show how easily this rule may be applied.



Fist and fore-finger method of determining where to start roping the drum.

AGGREGATES for FRIANT DAM

Extra-Thorough Washing Required; Peak Output 1,300 Tons per Hour



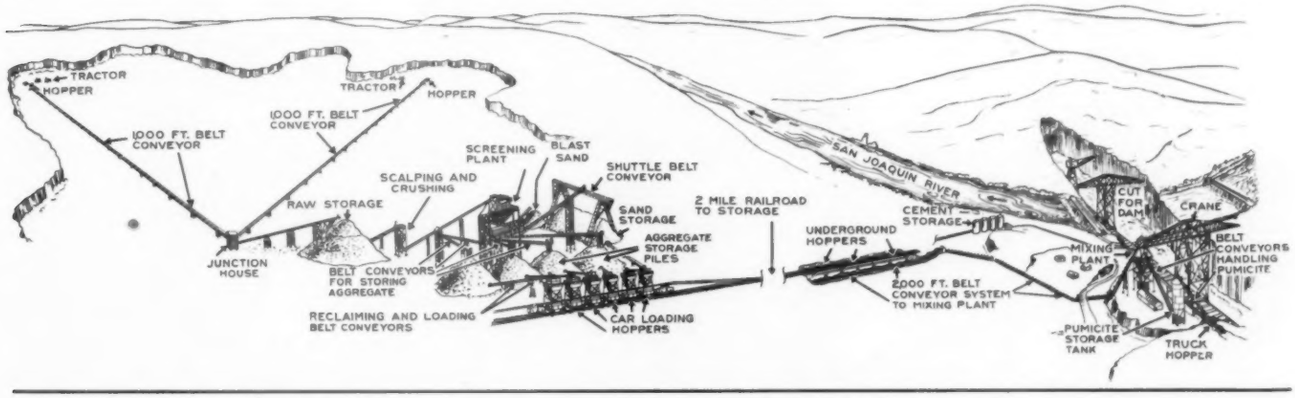
A view from the screening tower showing stock-pile ladder, blast-sand plant and some of the reclaiming conveyors and loading bins.

By W. E. TRAUFFER

IN the March, 1941, issue of PIT AND QUARRY was published an article describing the production of aggregates for the construction of Shasta Dam near Redding, California. This dam, on the Sacramento River near its head-waters, is to act as a monitor on this river and several of its major tributaries. It will regulate the flow of the river for navigation control, salinity repulsion, electric-power generation, etc. The provision of water for irrigation in the Sacramento River Valley is comparatively unimportant. It is the major construction part of the $228,000,000 Central Valley Project of the United States Bureau of Reclamation.

Friant Dam is the major construction part of the Central Valley Project in the San Joaquin River Valley. In this southern branch of the Central Valley of California the need for water for irrigation purposes is paramount and flood control and electric-power generation are comparatively unimportant. The main purpose of the entire project is to save some of the water wasted during periods of high water through the Sacramento River and divert it into the San Joaquin River Valley to supplement the water retained by Friant Dam.

Friant Dam will be the fourth largest concrete dam in the world, with 2,250,000 cubic yards of concrete. Only Boulder Dam with 3,250,000 cubic yards, Shasta Dam with 6,100,000 cubic yards, and Coulee Dam with 10,500,000 cubic yards, are larger. It is to be a straight gravity-type structure 320 feet high and 3,430 feet long at the crest. There will be an overflow spillway in the center and river-regulating outlets through the dam. Initial construction plans do not include a power-plant. Its



Sketch showing lay-out of the aggregates and concrete plants in relation to the dam site.

Two pairs of scrapers being loaded in tandem.

reservoir will have a capacity of 520,000 acre-feet. Much of the water stored will be diverted at the dam into the Friant-Kern and Madera Canals.

Friant Dam is located about 20 miles north of Fresno on the San Joaquin River, which flows out of the high Sierra Nevadas south of Yosemite National Park. An interesting feature of this dam is the fact that pumicite, which is available locally, is being used in the concrete. The specifications for

The screening tower with gold-reclaiming plant in foreground.

concrete permit the substitution of pumicite, by weight, for 20 per cent. of the specified amount of cement in the mass concrete. This practice has been found to effect a considerable reduction in the heat of hydration or setting of the cement and makes a more workable mixture and a denser, more nearly water-tight concrete. The pumicite-cement concrete has a lower strength at early ages than straight Portland-cement concrete but the strengths at one year are about the same.

The firm of Griffith Company & Bent Company, Los Angeles, was the low bidder at $8,715,358 for the construction of Friant Dam, including the excavation, processing and transportation of the aggregates. The time allowed for the construction is 1,200 days (3¼ years) starting November 1, 1939. All the materials for the permanent work are being furnished by the Bureau of Reclamation at an estimated additional cost of $7,300,000. The placing of the concrete is expected to average about 150,000 cubic yards per month and equipment is planned for a maximum capacity of 250,000 cubic yards per month.

The sand and gravel used in this project came from a deposit 30 feet deep in an area of 190 acres on the east bank of the San Joaquin River 2½ miles below the dam. About 750,000 cubic yards of overburden had to be removed to uncover this material. It was originally planned to locate the plant on this deposit, but this would have prevented the utilization of some of the material, so the contractor leased enough ground adjacent to the deposit for the plant site. This site was also on a higher level and eliminated any possibility of damage from floods.

The plant was designed and engineered by the Los Angeles branch of the Stephens-Adamson Manufacturing Compay, which also supplied most of the equipment and had a field engineer on the job during its erection. Designed for a minimum capacity of 600 tons per hour, this plant has actually produced 1,300 tons per hour. In order to insure its completion in the limited time available construction was begun before the design was completed. For the same reason steel was used wherever possible and much of the fabricating was done on the job. The plant went into operation June 15, 1940, and up to April 1, 1941, had produced 1,310,000 tons of material.

The river-bed deposit is very well graded and consists of hard, sound rock. However, each piece of gravel is covered with a very fine silt or pumicite dust originating in the many pumice and pumicite deposits in the valley above this point. This dust is so fine that it has penetrated even into the microscopic pores of the rock. Unusually thorough washing is necessary to remove it. The deposit averages from 30 to 40 per cent. sand and most of the gravel is under 6 inches in size. The small amount of bowlders up to 14 inches in size is crushed and added to the raw material.

The conveyor system, which carries the material from the pit to the plant, was designed so that the haul from any part of the pit would be as short as possible. Two permanent field conveyors, 1A and 1B, were installed at right angles to each other. These 36-inch belt-conveyors are, respectively, 900 and 1,100 feet long. Both discharge into a junction box from which the material falls on the 42-inch by 296-foot conveyor, No. 2. From this conveyor the material is discharged on a raw-material stock-pile with a live-storage capacity of 3,500 tons.

Nine 12-cubic yard Le Tourneau Carryall scrapers hauled by Caterpillar RD8 Diesel tractors are used to collect the material and haul it to the field con-

The sand stock-pile system with conveyor from plant feeding shuttle conveyor.

veyors at the pit end of each one of which is a 50-cubic yard 16- by 20-foot timber hopper with transverse grizzly bars spaced 12 inches apart. Usually 8 scrapers are in operation at one time and these work in pairs while loading. In each pair the second tractor has a bull-dozer with a hook which engages a pin on the first scraper. The first scraper is loaded first and as soon as it is lifted the second scraper is loaded. In this way each scraper has one tractor pulling and one pushing while loading. As soon as both scrapers are loaded they are disengaged and proceed separately to the hoppers. The tractors haul the scrapers over the hoppers and their contents are discharged through the grizzlies. Under each hopper is a 3½- by 15-foot double reciprocating plate-feeder at right angles to the field belt-conveyor. Both plates feed toward the center and on the belt.

Conveyor leading to raw-material stock-pile. Plant at left.

Under the raw-material stock-pile is a 3½- by 15-foot double plate-feeder which supplies the 36-inch by 156-foot tunnel reclaiming belt-conveyor (No. 3). This feeder is driven by a 20-horsepower motor through an Allis-Chalmers variable-speed drive controlled from the screening tower. The material is discharged at the desired rate on a 5- by 10-foot Stephens-Adamson vibrating-screen equipped with grizzly bars spaced 8½ inches apart. The small amount of oversize gravel goes into an Austin No. 105 gyratory crusher. The crushed gravel and that falling through the grizzly combine on the 36-inch by 410-foot No. 4 belt-conveyor running to the top of the plant.

A general plant view with main conveyor in foreground. In background is the sand stock-pile with gravel-storage pile at right.

The material is discharged from the conveyor into a receiving bin of about 125-cubic yard capacity. A swinging arm and push-button switch under the conveyor head pulley automatically shut off the feed when the bin is full. Under three corners of this bin are 3- by 7-foot reciprocating feeders with adjustable cranks serving three 4- by 12-foot Stephens-Adamson vibrating screens. A fourth screen can be installed at any time, and there is an opening in the bin for it. These three screens make 3- to 8½-inch gravel on their top decks and 1½- to 3-inch gravel on their bottom decks. What goes through their bottom decks is feed for the fine-sizing screens on the floor below. On each of the three screens a large water spray hits the material as it comes off the feeders, which face in a direction opposite to the direction in which the material travels over the screens. A back plate on each screen helps to spread the material over its full width and additional washing sprays are also used.

The two coarse sizes of gravel from these three screens are discharged into two special chute cars, one serving a single screen and the other a pair of screens. Both cars are on a track between the screens and can be moved out of the way when the screen cloth is being changed. Each car is 5 feet long and 4 feet wide and is divided by steel plates into a central vertical compartment and two side compartments. The gravel passing over the top decks of the screens goes into the center compartment and is discharged between the rails on a 30-inch by 30-foot belt-conveyor which feeds a stock-piling belt-conveyor. The gravel passing over the bottom deck drops through one of the two side compartments into one of the two sides of a hopper under the same belt-conveyor. This hopper feeds this gravel on another 30-inch by 30-foot belt-conveyor below the first and parallel to it. This conveyor feeds another stock-piling conveyor.

The minus 1½-inch material falling through the bottom deck of each of these three screens goes to a pair of 4- by 12-foot 2-deck Stephens-Adamson screens on the floor below. These 6 screens, which are also equipped with sprays, make ¾- to 1½-inch gravel and ¼- to ¾-inch gravel on their two decks. These products go to four chute cars on a single track between the two rows of screens, two cars serving two pairs of screens and each of the other two serving a single screen. Here again a fourth set of screens can be installed if necessary. These four cars feed the two sizes of gravel on two 30-inch by 30-foot belt-conveyors arranged in the same way as those on the floor above and feeding individual stock-piling belt-conveyors.

The sand falling through the bottom decks of these screens goes into a com-

One of the tractor-drawn scrapers discharging into hopper at end of field conveyor.

mon flume feeding a Western Machinery Company 16-foot diameter hydroseparator. Sand is fed out through the conical bottom of this machine by a revolving scraper arm, and a rubber pinch valve can be used to control or shut off the discharge. The sand is split to the first two of a row of 4 inclined screw-type sand classifiers, each of which is 60 inches in diameter and 26 feet long. These usually produce sand above 40-mesh. The fine material overflowing each of these two screws goes to one of the other two screws which are operated very slowly in order to retain as much as possible of the fine sand. These screws produce the 40- to 100-mesh sand fraction. The overflow of the hydroseparator and that from the two final screws goes to waste.

The coarse sand from the first pair of screws and the fine sand from the second pair go into separate 9-cubic yard hoppers of special design. Each of the two hoppers is pivoted and has an overflow gate so arranged that when it becomes too full the hopper will tilt and the excess sand will overflow into a waste launder. Hardinge constant-weight feeders attached to the hoppers are used to feed any desired proportions of the two sand fractions to a stock-piling belt-conveyor. The high percentage of sand in the deposit makes it practicable to blend these fractions without first storing them, and to waste any excess of either size and still produce more than the necessary tonnage of sand.

One of the six final-sizing screens has cloth on part of its bottom deck for the production of a comparatively small quantity of sand-blast sand when this is needed. This sand is used at the dam to clean away all laitance or foreign matter from the concrete in the dam before another block is poured on top of it. A gate can feed this sand either with the general flow of sand or on an 18-inch by 73-foot belt-conveyor which feeds it to a stock-pile. This pile has a live-storage capacity of 100 tons and sand is reclaimed from it on an 18-inch by 255-foot tunnel belt-conveyor. The sand goes through a 5- by 18-foot gas-fired rotary drier and is then elevated into a 20-ton rainproof bin for loading into railroad cars on a separate track.

The blended concrete sand is carried on a 30-inch by 250-foot belt-conveyor to a 30-inch by 90-foot shuttle belt-conveyor set at an angle with it. The shuttled belt-conveyor is mounted on a steel framework and can discharge from either end to form a long stock-pile with a live-storage capacity of about 6,000 tons.

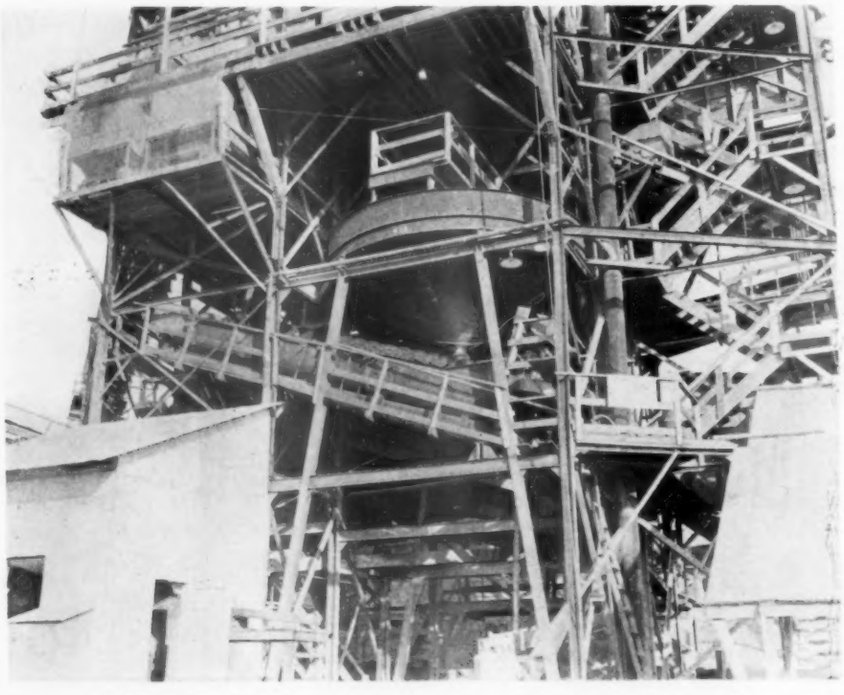
Three of the four sizes of gravel, from coarse to fine, are discharged on separate 30-inch stock-piling belt-conveyors whose lengths are, respectively, 110, 75 and 76 feet. The pea gravel is discharged on a conveyor which feeds a 100-foot stock-piling conveyor. Steel rock ladders minimize breakage in dropping these aggregates on their piles. In the above order the stock-piles have live-storage capacities of 1,500, 1,500, 1,500 and 3,000 tons each.

A hopper-shaped hole was excavated for each of the gravel stock-piles to reduce the amount of dead storage. The sand stock-pile is over a 180-foot tunnel with 26 gates. Coarse rock or rip-rap from the dam excavation was piled on both sides of this tunnel to prevent the waste of blended sand in dead storage and to promote drainage of the stored sand.

Under each of the four gravel stock-piles is a laminated-wood tunnel in which is a reclaiming belt-conveyor. In the same order these conveyors are 36 inches by 136 feet, 24 inches by 156 feet, 24 inches by 163 feet and 36 inches by 191 feet. A 30-inch by 360-foot conveyor is used in the sand stock-pile tunnel. Each of the gravel conveyors feeds one of six 40-cubic yard

This view shows the raw material stock-pile and the scalping and crushing arrangement.

Looking at main conveyor from crusher to screening tower.



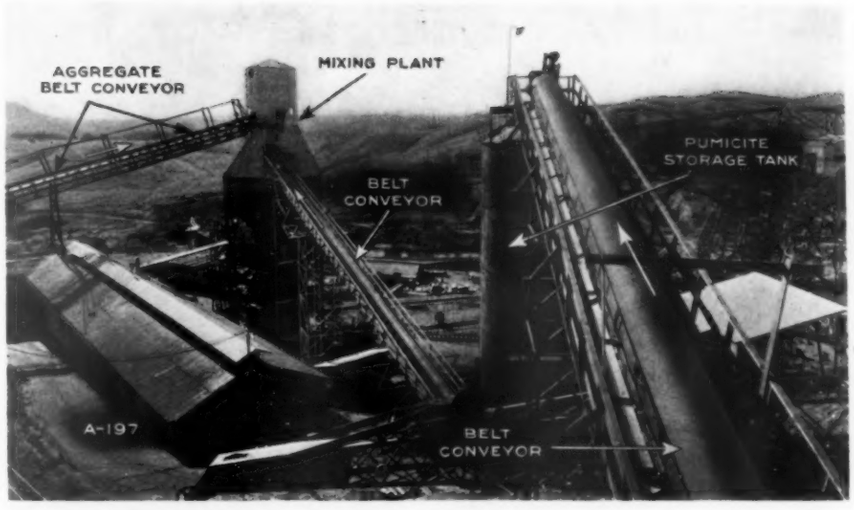
Hydro-separator and some of the screws used for washing and sizing sand.

steel car-loading bins. The sand conveyor feeds direct into one of these bins or to a short cross belt-conveyor discharging into a second bin. Each of these bins holds enough material to fill one bottom-dump railroad car and their spacing is such that their centers are the same distance apart as the centers of coupled cars. This makes it possible to load six cars at once. Special drop-chute gates are dropped into one end of the car and choke off the flow automatically as the desired level is reached. The train is then pulled slowly forward, filling the cars to the exact level desired with no spillage. A train is loaded in less than a minute.

The loaded cars are hauled by General Electric Diesel-electric locomotives two miles to the dam site, where the contents of the six cars are discharged into the six 1,300-ton compartments of a ground-level hopper. These hoppers compartments are spaced a car's length apart. Aggregate is withdrawn from each compartment through two pivoted hinged-type, air-operated gates, which drop one material at a time on a 36-inch by 345-foot tunnel belt-conveyor. A series of four 36-inch belt-conveyors, 464, 300, 539, and 285 feet long, carry the aggregates to the top of the concrete central-mixing plant at the dam. The first three conveyors carry the materials from the 330-foot tunnel level to an elevation of 510 feet and the last conveyor discharges into the concrete plant bins at an elevation of 600 feet.

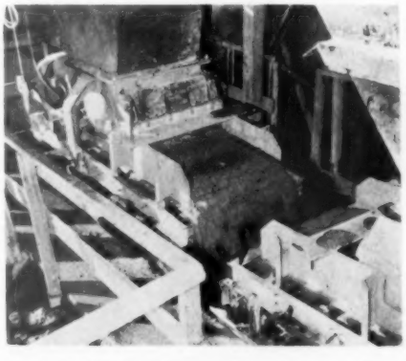
One of the field conveyors as seen from the discharge end.

This entire conveyor system is controlled from the batching floor of the concrete plant. A switchboard contains control switches for each of the conveyors. There are also special switches for the feeders under each of the track-hoppers and a key which can be plugged into only one switch at a time. This makes it impossible to feed more than one material at a time to the conveyor system. As an additional precaution lights indicate the position of each gate at all times.



View showing arrangement of conveyors to pumicite storage and concrete-mixing plants.

The pumicite which is used as an admixture in the concrete is dug from deposits which will be under water when the dam is completed. It is dumped from trucks into a hopper from which a 42-inch by 8½-foot belt-feeder discharges it into a Stephens-Adamson double-roll crusher with 42-inch rolls set about ½ inch apart. A 24-inch by 85-foot belt-conveyor discharges the pumicite into a 16-foot diameter by 63-foot high steel storage tank with conical top and bottom. As the pumicite does not always flow freely a revolving-paddle agitator is used to insure a steady supply of material to a 72-inch diameter table-feeder under the bin. A series of two 18-inch by 200-foot belt-conveyors feed the pumicite into a bin compartment in the concrete central-mixing plant. Both conveyors are inclosed by a corrugated-metal housing and all the transfer points are sealed to eliminate dust.



Feeders discharging, in desired proportions, the coarse and fine sand fractions on conveyor.

Bulk cement from three different plants is delivered at the dam in boxcars and is unloaded pneumatically, blended for color, and stored in four 5,900-barrel steel silos. From the silos the cement is pumped by an 8-inch Fuller-Kinyon pump into the bins of the C. S. Johnson concrete central-mixing plant. Standard batching equipment serves four 4-cubic yard mixers. The concrete is discharged into four 4-cubic yard bottom-discharge buckets. These are hauled four on a car by Diesel-electric locomotives. Concrete is placed by means of derricks and cranes.

The sand-and-gravel deposit is in an area known to contain gold in paying quantities, in fact prospectors are still working in this region. Investigations proved that there was enough gold to justify the installation of equipment for reclaiming it. At this plant the sand from the launders under the final-sizing screens is diverted through a series of screen-lined chutes before going to the hydroseparator. The gold and other heavy particles imbed themselves in the screens but the water flow is so rapid that the sand is carried over them.

The concentrates drop through the screens into a box which is cleaned out three times weekly. The concentrates are washed out of the box over a 24-inch Southwestern Kraut diaphragm jig from which they go into a Mill & Mine Supply Company amal-

(Continued on page 85)

The four 5- by 26-foot sand screw-classifiers and dewaterers.

A.S.T.M. Committees Meet; Seek Approval of Ready-Mix Tests

THE 1941 Committee Week of the American Society for Testing Materials held in Washington, D. C., March 3 to 7, inclusive, at the Mayflower Hotel was marked by more meetings of the Society's technical committees than have been held in any previous year and by the registration of over 1,000 materials engineers and testing experts.

This Committee Week, as it has come to be termed, provides an opportunity for scheduling meetings of as many committees as wish to take part, in a concentrated period, thus conserving the time of members at meetings, traveling expenses, and the like. While the location of the meetings has influence on the number of committees taking part, the unusual extent of these 1941 meetings and the results of the sessions is a definite indication of the intense activity in materials standardization and research as carried out by the A.S.T.M.

The registration figure 1020 does not include those attending meetings of two Society groups covering electrical insulating materials and plastics which were also held in Washington during the same week at another hotel.

Practically every one of the more than 200 meetings, including subcommittee and main committee meetings, were well-attended. Resulting from the discussions will be many new purchase specifications, testing procedures, needed research data on materials and other information. Most of the material will be included in the annual reports of the committees to be presented at the Society's annual meeting in Chicago on June 23 to 27.

There was notable acceleration of the Society's work in developing quality specifications for materials undoubtedly brought about in large part by national defense exigencies, but also responsible is the more streamlined action which recently has become in effect in the Society's standardization procedure.

As a result of the meetings of *Committee C-9 on Concrete and Concrete Aggregates,* four important new tests and specifications are to be offered to the Society at its annual meeting in June in Chicago for publication and approval as tentative standards. The three test methods for which there has been definite demand will cover (1) the sampling of wet concrete, (2) methods of determining volume of air entrained in concrete, and (3) standardized procedures for determining the thickness of cores drilled from a concrete structure.

The proposed new tentative specifications for ready-mixed concrete which if accepted will comprise a tentative revision of the existing standard covering this material, C 94, include a number of improvements brought about in part by progress in this industry, and increasing demands for the material. In proposing the new requirements, Committee C-9 felt it desirable to keep the present standard in effect for the time being.

Other recommendations which will be offered involve revisions in the following tests and specifications:

Method of Test for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate (C 88—39 T)
Method of Test for Abrasion of Coarse Aggregate by Use of the Los Angeles Machine (C 131—39)
Specifications for Lightweight Aggregates for Concrete (C 130—39)

At the meeting of *Committee C-7 on Lime,* attended by 26 members and guests, action was taken upon the following projects, those involving standards and methods of test to be submitted to the entire committee for letter ballot:

1. Dr. F. O. Anderegg, chairman of a working subcommittee on *Lime in Mortar,* submitted a preliminary report which included a discussion of the contribution of lime to the properties desired in mortars, and a brief résumé of the present knowledge of lime in mortar gained from studies made by investigators in the United States and foreign countries. A comprehensive bibliography on the subject was presented by the subcommittee, as an appendix to the report. It was decided to submit the report and bibliography to Committee C-12 on Mortars for Unit Masonry for its consideration.

2. For the purpose of standardizing test conditions in connection with investigations on mortars, the following values were assigned to cubic foot quantities of the usual ingredients in mortars:

	Pounds per cubic foot
Lime hydrate solids*	50
Portland cement	94
Sand	80

3. The committee adopted a resolution presented by Subcommittee II recommending that an investigation of hydrated limes be made looking toward a revision of Standard Specifications for Hydrated Lime for Structural Purposes (C 6—31) which would establish a maximum limit on the unhydrated oxides of calcium and magnesium.

4. Consideration was given to proposed specifications for quicklime for causticizing purposes in the paper industry. Including certain changes which were suggested, these specifications are to be sent to all members of the committee for consideration so that action can be taken at the June, 1941, meeting.

5. A canvass of the purchasing practices of leading varnish manufacturers was conducted by the committee during February, 1941. This led to the conclusion that no revisions were necessary in the Standard Specifications for Hydrated Lime for Varnish Manufacture (C 47—27), which have stood without change since 1927. They, therefore, are to be continued as standard.

6. It was decided to initiate a series of tests on the various sugar and other methods for determining available lime for the purpose of standardizing on a simple and fairly accurate method which can be used by the producer and consumer of lime products.

7. Subcommittee V on Methods of Test has under way the development of analytical methods for determining the amount of arsenic, fluorine, and lead which may be present in lime used in the manufacture of food products.

8. Data are being collected by the committee on the various methods used in slaking quicklime on the job for the purpose of duplicating these conditions in the laboratory and preparing a laboratory procedure on slaking.

9. The committee authorized the initiation of a study on the factors which influence the settling rates of quicklimes and hydrated limes used for chemical purposes.

10. Several revisions in the Tentative Methods of Physical Testing of Quicklime and Hydrated Lime (C 110—38 T) are contemplated but as the work incident thereto will not be completed in the near future, the committee decided to recommend to the Society that these methods be continued as tentative for another year.

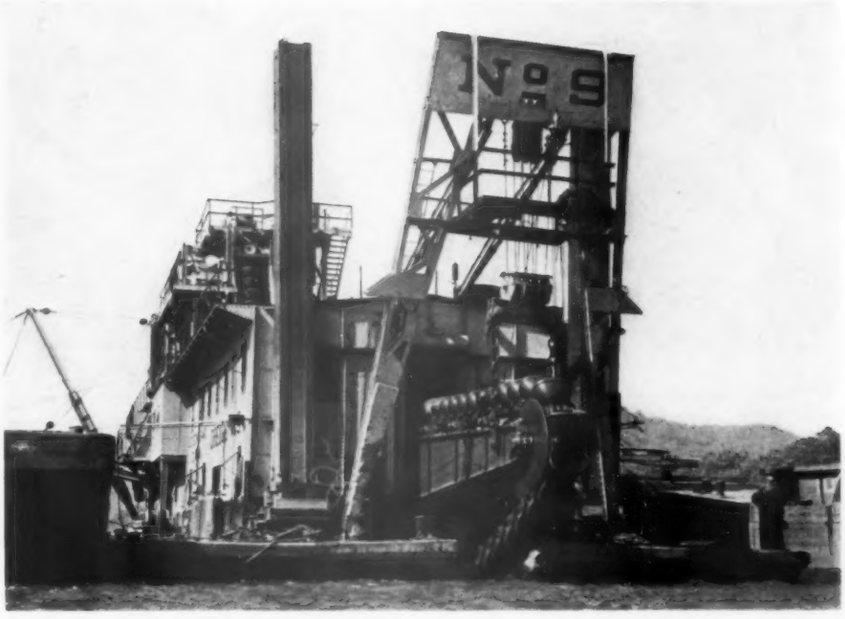
In order that certain requirements in the Standard Specifications for Gypsum Partition Tile or Block (C 52—33) may be more in line with the Federal Specifications, A.S.T.M. *Committee C-11 on Gypsum* agreed on certain modifications which will be offered for immediate adoption as standard.

Consideration is also being given to the incorporation of the so-called ammonium acetate method for determining the purity of gypsum as an alternate to the gravimetric method, considerable data on this subject having been re-

(Continued on page 85)

*A 50-pound bag of hydrated lime shall be considered as one cubic foot of material. When quicklime putty is used, 50 pounds of solids in sufficient putty shall be considered one cubic foot of lime-hydrate solids.

Dravo Dredge Rebuilt to Provide Floating Plant With Hourly Capacity of 250 Tons of Aggregates



A front view of Dredge No. 9 showing the huge digging ladder raised above water level.

By W. E. TRAUFFER

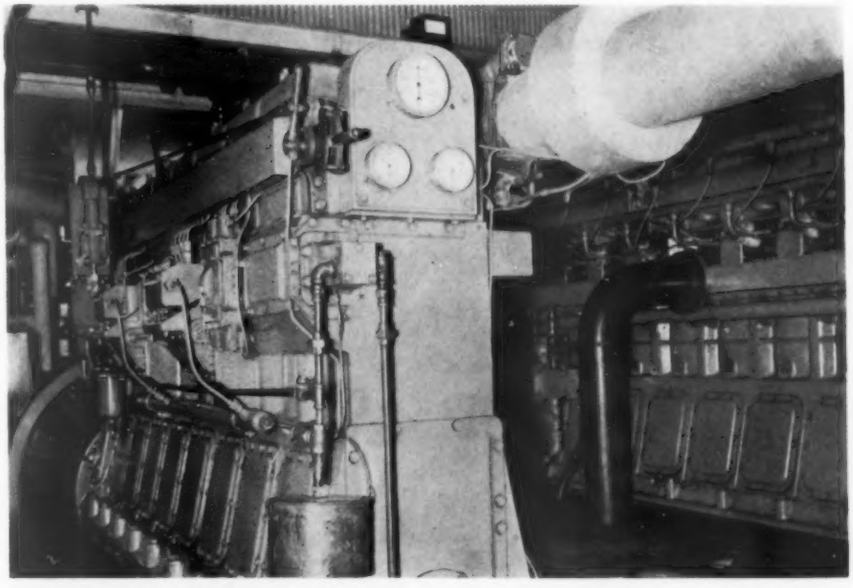
THE huge ladder dredges which are used in some sections of this country to produce river sand and gravel are among the most spectacular operations in this industry but comparatively few people have ever visited them because of their inaccessibility. These floating plants are usually located in the middle of a river far from the shore yards to which their products are delivered. One of the largest and most up-to-date ladder dredges is dredge No. 9 operated by the Keystone Sand Division of the Dravo Corporation, Pittsburgh. This dredge operates in the Ohio River and its products are delivered in barges to shore distributing points in Pittsburgh and the vicinity. The company operates a fleet of 71 steel barges of 500 tons capacity each and 5 tow-boats to deliver the material produced by this dredge and another, dredge No. 8.

Dredge No. 9, which was originally built by the Dravo Corporation in 1929, was rebuilt and enlarged in 1939 at a reported cost of $250,000. This work was done chiefly to increase the capacity of the dredge, but many other factors were partly responsible. Aggregate specifications in this area were requiring more crushed gravel and finer sand and the restrictions on clay and softstone content were becoming more severe. A crusher was installed to produce crushed gravel and facilities were added for recovering more of the fine sand. Two revolving scrubbers were installed to insure a clean product. Only one scrubber is actually needed except when operating in certain sections of the river where there is an excessive amount of tough blue clay. Other new equipment installed included 6 vibrating screens, 4 belt-conveyors and the necessary chutes and hoppers.

The original power-plant on this dredge was a 125-horsepower steam engine by which all the equipment was driven. The digging and handling elevators, speeds, hoists and some auxiliary machines are still driven in this way. All the new equipment units have independent electric motors for which power is supplied by two 200-kilowatt Diesel-generator sets.

Enlargement of the dredge hull and alterations and additions to the superstructure were necessary to accommodate the additional equipment. The steel hull was lengthened 12½ feet and widened 12 feet. It is now 158 feet long, 50 feet wide and 6¾ feet deep. This was done by splitting the hull crossways near the front end and inserting a 12½-foot prefabricated section. The hull was also opened lengthways near both sides and sections 6½ feet and 5½ feet wide were inserted. All this work was done by the Engineering Works Division of the Dravo Corporation at its marine ways on Neville Island, Pennsylvania.

The digging ladder is 74 feet long center to center and can dig to a depth of 40 feet. On the ladder are 84 4-cubic foot manganese-steel buckets. This ladder discharges an average of 30 bucket-loads per minute, or 350 to 400 tons per hour, on the 4- by 8-foot Allis-

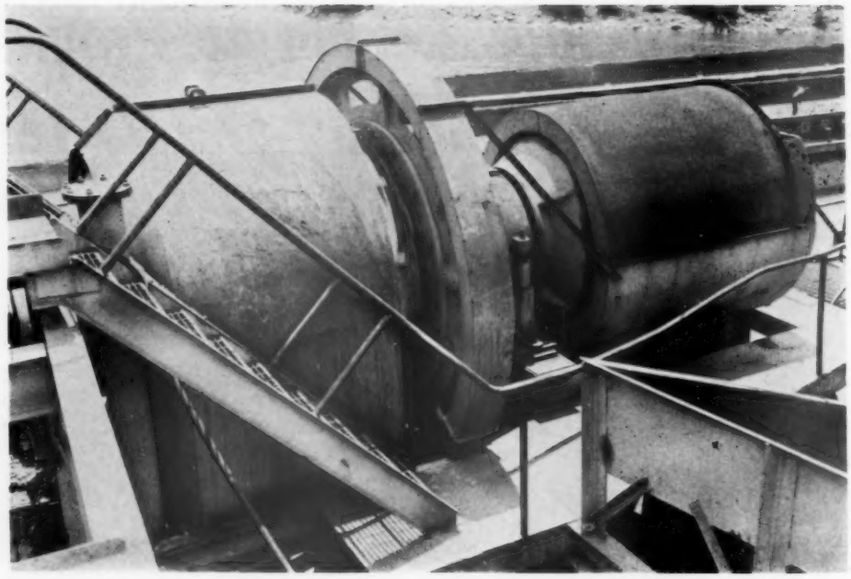


The two Diesel engines and generators which supply power for the new equipment.

Chalmers Low-Head 1-deck vibrating scalping screen. Perforated plate with 5-inch square openings is used on this screen. The oversize is wasted back into the river. The percentage of waste is usually small.

A solid section of steel plate at the feed end of the screen takes the shock of large bowlders, ranging up to 20 inches in size, which drop on it. This plate is covered with a 1-inch thick sheet of rubber over which are ½- by 3-inch steel bars fastened in such a way as to allow a certain amount of free movement independently in a vertical plane. A bowlder will strike one or more bars and the rubber absorbs much of the impact.

Sand and gravel falling through this screen go to the sump of the 41-foot centers main elevator, which has the same type of buckets as the dredging ladder but of 4-cubic foot capacity. The material is discharged on a 6- by 14-foot Allis-Chalmers 2-deck screen which separates the sand and regular gravel from the oversize to be crushed. This screen is equipped with perforated plate with square openings. The first two-thirds of the top deck has ¾-inch openings and the last third has openings ranging from ¾ inch up to 2½ inches in size depending on conditions. On the bottom deck ⅜-inch openings are used.



Revolving scrubber and screen used when excessive amounts of clay are recovered.

The boom conveyor loading two sizes of gravel into barges.

The sand falling through the bottom deck goes to a pair of 5- by 12-foot Allis-Chalmers 2-deck screens. These are equipped with ¼-inch perforated plate on their top decks and ⅛-inch on their bottom decks. The material passing over the top decks of these screens, known locally as shot, can either be wasted or mixed from surge boxes with the grits retained on the bottom decks and loaded on barges by a 24-inch by 45-foot boom belt-conveyor. The ⅛- to ¼-inch grits can also be loaded out separately or wasted. Sometimes it is desirable to blend some of this material with the sand passing through the bottom decks of these screens. The sand drops into a steel sand-tank and a dewatering bucket-elevator feeds it to a chute for loading into barges.

Uncrushed gravel is produced from the material passing over the bottom deck of the separating screen. This gravel is discharged into a surge-box from which it can be discharged to waste, to a scrubber ahead of the final sizing screen, or direct to the screen. This material is usually fed first to the 6- by 18-foot Allswede 4-compartment revolving-scrubber which is loaded with 6 tons of 4½-inch forged-steel balls. The combined scrubbing and grinding action breaks down clay balls and soft stone. The 5- by 12-foot 3-deck Allis-Chalmers Low-Head screen following the scrubber is equipped with ¾- and ⅜-inch openings on the top and middle decks. Either ⅛- or ¼-inch openings are used on the bottom deck. The material falling through the bottom deck, mostly deleterious matter, goes to waste.

Although three sizes of uncrushed gravel are made by this screen, only two can be loaded at one time on the two barge-loading belt-conveyors. Surge-boxes under the screen make it possible to feed each of these products singly or in any desired combination to either of the two loading belts or to waste. It is usually necessary to waste very little of this gravel. A 24-inch by 20-foot boom belt-conveyor, known as the "inboard" belt, loads the barge nearest the dredge. A 24-inch by 45-foot "outboard" boom belt-conveyor loads the second barge. Four 500-ton barges are usually loaded simultaneously.

The gravel passing over the top deck of the separating screen is usually fed direct to the crusher on a 24-inch by 60-foot belt-conveyor. Only under special conditions is this gravel first fed to the 7-foot by 48-inch Hardinge conical scrubber. This machine is used when digging in a section where there is a large amount of clay. When large-size uncrushed gravel is being produced the scrubber breaks down the soft stone in this material which is then discharged from the above belt-conveyor on the final uncrushed-gravel screen which has already been described. Attached to the scrubber is a 48-inch dewatering section with ⅜- by ¼-inch perforated slots. Water and deleterious

matter falling through these openings is wasted. In this scrubber the cobbles act as their own grinding media.

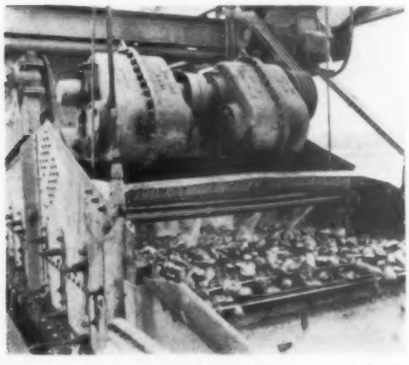
The Pennsylvania C-7-38 Impactor is a refined type of hammer-mill which was developed for this work. It is reversible, with breaker plates at each end, but has no grate bars. Manganese-steel hammers throw the gravel against the nickel-iron breaker plates. This machine is driven by a 100-horsepower Westinghouse weather-proof d.-c. motor through a Falls flexible coupling. It can be operated at any speed between 300 and 900 r.p.m. as required by the degree of reduction desired. The feed to this crusher is from 80 to 90 tons per hour.

The crushed gravel goes to a surge-box from which it can be fed back into the sump of the main elevator and

At right is the main digging ladder. At left is the elevating ladder which follows the scalping screen.

mixed with the uncrushed gravel. The regular uncrushed gravel produced thus averages about 40 per cent. crushed.

When crushed gravel is being made the crusher product is discharged from the surge-box on a 5- by 12-foot Allis-Chalmers 2-deck Low-Head screen. The screen openings used are varied according to the size of crushed gravel desired. Only one size is made at a time, the oversize and undersize going back into the sump of the main elevator. This practice increases the



The 6- by 14-foot double-deck screen which separates sand, gravel and oversize to be crushed.

This reversible hammer-mill is used to crush oversize gravel.

amount of desirable minus 100-mesh material in the sand. The crushed-gravel product goes to the inboard barge-loading conveyor.

The new equipment installed on this dredge is driven by 13 Westinghouse weather-proof electric motors. Current for them is generated by two Elliott 250-volt, variable-speed, d.-c. generators direct-connected to two Cooper-Bessemer Diesel engines. The output of each generator increases from 140 kilowatts at 525 r.p.m. to 200 kilowatts at 750 r.p.m. but the voltage remains constant. They are usually operated at 550 r.p.m. The ratings of the two 8-cylinder Diesel engines range from 210 horsepower at 525 r.p.m. to 300 horsepower at 750 r.p.m. Ordinarily one Diesel-generator is able to supply all the power needed, the second one being used only when both scrubbers and the crusher are in operation.

Water for washing is supplied by two 6-inch Lawrence centrifugal pumps. One is a high-pressure pump for the screens and other equipment on the top deck of the dredge. The low-pressure pump supplies water to the other equipment. Deister "Concenco" spray nozzles are used on the screens.

A.S.T.M. (from page 82)

ferred to the committee.

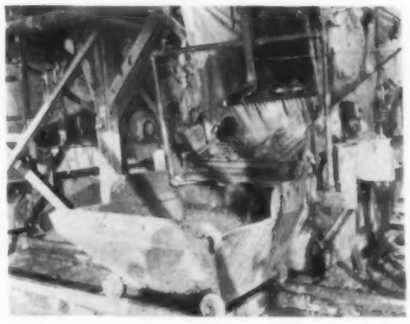
In the Standard Methods for Testing Gypsum and Gypsum Products (C 26—40) the committee will propose that the sections on absorption tests (both total and rate of absorption) be deleted for the reason that no requirements on this property are incorporated in quality specifications and consequently the method seems unnecessary.

One of the important activities of the society committees is in connection with nomenclature and standardizing of terms and definitions. Committee C-11 has developed changes in the terms covering gypsum lath, gypsum wall board and gypsum sheathing board which will be recommended for adoption as standard. The committee will also recommend the dropping of the definitions of the term "gypsum plaster board."

Friant Dam (from page 81)

gamating barrel to whose mercury-coated plates the gold adheres. The waste material goes to a 12-inch Kraut jig which catches any remaining gold before the material goes to waste.

The water used for washing in the sand-and-gravel plant is supplied by three 8- by 10- by 18-inch Byron-Jackson process pumps, each direct-connected to a 200-horsepower motor. Each pump has a capacity of 2,000 g.p.m. against a total head of 300 feet. These pumps are located about a mile up-stream from the plant.



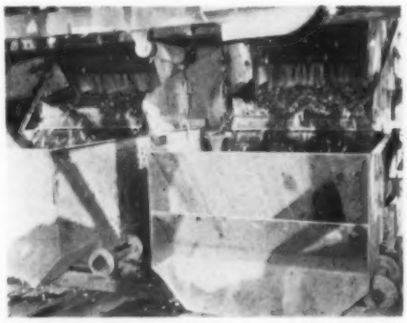
Two of the coarse-sizing screens. Chute car in foreground.

The Abbey-Scherer Company supplied all the screen cloth used in this plant. General Electric motors predominate.

About 14,000 feet of conveyor belting is used and this is all "Trans-Cord", a new cord design developed by the B. F. Goodrich Company. This is the first large installation of this belting in which the cord design used in tires is applied. All the belts were spliced with special field vulcanizers.

R. C. Calland is acting supervising engineer of the Central Valley Project for the U. S. Bureau of Reclamation and R. B. Williams is construction engineer in charge of the Friant Division. A. S. Hartley is in charge of the bureau's field office at the aggregate plant.

H. Stanley Bent is project manager for the Griffith Company and Bent Company and H. M. Slocum is general superintendent. P. O. Hayes is plant superintendent.



Two of the six final-sizing screens with chute cars receiving the products.

ALUMINOUS CEMENT

By DR. GABRIEL A. ASHKENAZI

DURING the last World War rumors were circulated that the French military engineers were using a new kind of cement for big-gun foundations. It has been told that this new cementing material develops remarkable strength at very early ages and that its concrete is ready for use 24 hours after placing. Some of the experts presumed that the French used a kind of magnesia cement similar to that of Sorel. However, reports that this new material shows good resistance to ground waters made this presumption improbable.

After the war it became known that the new cement comprises a combination of less basic aluminates of calcium.

It was Jules Bied,[1] the chemist of the French cement concern J. and A. Pavin de Lafarge, who discovered this new cement and worked out the commercial method of manufacturing. His first French patent had been granted in the year 1908, but it was ten years later before this product came on the market. It has been named fused cement *(ciment fondu)* because its manufacture involves melting raw materials in contrast to the production of Portland cement where the raw materials are heated only to the point of clinkering, which is below that of incipient melting.

The application for a British patent of the year 1909 claims:

1) a process for the manufacturing of cement . . . "consisting in melting in a water-jacketed or in a similar furnace a mixture of bauxite or of aluminous and ferruginous primary materials, containing relatively little silica, with lime, the melted product rapidly cooled, then granulated and finally friturated."

2) The industrial product constituted by a cement . . . "containing relatively little silica, the proportion of lime being defined approximately by the formula: SiO_2. 2CaO + Al_2O_3. CaO."

Several years later Bied defined his cement by the general formula: x C S + y CA, where the ratio of x:y may vary from 0.25 up to 0.90 thus permitting large variations in its chemical composition.[2]

Fused cement, or aluminous cement, also called high-alumina cement, presents a binding material of extraordinary properties. Unfortunately the only material suitable for its manufacture—bauxite—is not everywhere available. The scarce distribution of bauxites naturally handicaps the development of producing aluminous cement. Nevertheless this cement is produced in most European countries. France, where this product originated and which is leading in the world production of bauxites, is also leading in the manufacture of aluminous cement.

In this country P. H. Bates [3] reported about his experiments with calcium aluminates cement as early as 1919. In 1921 he described a high-alumina cement clinkered in a rotary kiln.[4] Gravel concrete, made of this cement in proportions of 1 : 1½ : 5½, developed in 24 hours as high strength as a similarly proportioned Portland-cement concrete would have developed in 28 days. It should be mentioned that H. S. Spackman's Alca natural cements which appeared on the American market in 1910 do not belong in the category of aluminous cements. They represent a mixture of natural Portland cements with 5 or 10 per cent. of calcium aluminates. The composition of the admixtures is not specified. They act as energizers only. According to the date published by Spackman,[5] the addition of this energizing material resulted in an increase of tensile strength of about 60 to 100 per cent.

In 1926 the Michigan Engineering Experiment Station [6] published an investigation of an American commercial aluminous cement. Some time before Dalton G. Miller of the United States Dept. of Agriculture, testing various brands of Portland and special cements for their durability in corrosive solutions, investigated the behavior of an American-made aluminous cement. An exceptionally good resistance to the action of sulphate solutions has been established.[7]

It is worth mentioning that Bied's discovery had been hastened by his studies of the deterioration of Portland cement construction due to the presence of gypsum in the soil and in ground waters. The French cement school long before advanced the theory that the deterioration of cement construction exposed to the action of sulphate-containing water is caused by the formation of calcium-sulpho-aluminate. This compound, due to its large amount of crystal water, takes up a larger volume than the initial constituents of cement, thus producing a considerable strain which causes the deformation of the structure. Inasmuch as calcium-sulpho-aluminate, also called "cement bacillus," is produced by the action of sulphates on calcium hydroxide, released during the hydration of Portland cement, and the ensuing reaction of the so-formed calcium sulphate with the hydrated calcium aluminates, cementing material which would react with water without liberating calcium hydroxide should be more resistant to corrosion. This reasoning led Bied to the invention of aluminous cement, a product not containing the higher calcium silicates and chiefly consisting of less basic calcium aluminates. The fact that the latter compounds, such as CA and C_3A_5, develop high strength has been known.

The early strength of aluminous cement is due to the presence of these aluminates; in addition, the absence of calcium hydrate among its products of hydration makes it immune to attacks by the sulphates-containing waters. This writer does not share the opinion of the French cement school regarding the *rôle* of calcium hydroxide. The better resistance of aluminous cements is due to the precipitation of alumina hydrate rather than to the absence of free calcium hydroxide. It is, however, not within the scope of this article to relate the numerous objections to Le Chatelier's calcium-sulpho-aluminate theory. In one of his articles published in this journal [8] the author has already expressed his views on this subject.

Irrespective of some differences of opinion as to the causes of the better durability of mortar and concrete made with aluminous cement when subjected to the action of corrosive agents, the great majority of experts agree that the resistance of this material is superior to that of other cementing materials. Of course, the writer is aware of many observations mentioned in the literature contradicting this opinion. He is cognizant of failures. The reasons for these failures might be manifold. The mixing, placing and curing of aluminous-cement concrete require certain precautions. An excess of mixing water, a too-prolonged mixing, the placing of large mass of concrete in one operation unfavorably influence the development of strength. In some cases the kind and grading of the aggregates is apparently of great importance.

We are not referring to such self-evident cases as when the aggregates themselves may be affected by the corrosive agents. It is self-evident, for instance, that limestone or calcareous sands must not be used for concrete which may be subjected to the action of acid-containing waters. But even inert materials,

like siliceous sands, proved to be of different value. Dr. K. Dorsch [9] examined specimens made of aluminous cement and German standard sand and similarly-prepared specimens of the same cement and Rhine sand. The specimens were cured in aggressive solutions for a period of 500, 700 and 900 days. Despite the fact that the two kinds of sand could not be affected by the corrosive agents, the specimens made with Rhine sand proved to be more resistant.

The comparative results were as follows:

Time of Action	Tensile Strength (p.s.i.)				Corrosive Solution
	Rhine Sand		Standard Sand*		
	a	b	a	b	(a) 15% of magnesium chloride
500 days	840	897	580	610	
700 days	873	911	776	712	(b) 15% of sugar
900 days	940	957	684	592	

*German Standard sand is obtained from tertiary stratum of brown coal formation near Freienwalde on der Oder.

Aluminous cement generates a considerable amount of heat of hydration. Although the total amount of heat does not substantially exceed that of Portland cement, it is developed in a very short period of time. It has been established that the greater part of it is already released during the first ten hours. Practically, the total amount is generated during the setting time of the cement. In some countries the setting time is determined on a cement paste of normal consistency by following the temperature rise of the paste. The end of the setting is determined by the time when the temperature of the paste reaches a maximum. This property makes possible the use of aluminous cement for construction at low temperatures under conditions when concreting with Portland cement is absolutely impossible. Numerous constructions were successfully carried out at temperatures far below the freezing point. This writer is aware of concrete and reinforced-concrete work performed at temperatures as low as minus 4 degrees F. Concrete placed at such low temperatures showed quite satisfactory fast-hardening properties and afterwards proved to be of remarkable water impermeability.

Contrary to the outstanding ability of aluminous cement to harden at temperatures below the freezing point, its resistance is strongly affected when the temperatures of the mixture and placement are higher than 100 degrees F. So, for instance, concrete made with French aluminous cement and cured in water at different temperatures showed a sharp decrease in strength when stored in water of 158 degrees F.[10]

Kind of Storage	Compressive Strength (*p.s.i.*) at Age of:					
	2 days	7 days	14 days	28 days	50 days	90 days
In water of 57° F.	4,231	5,283	.....	6,194	6,508	6,593
In water of 158° F.	1,011	1,192	.....	1,439	1,524	1,619
7 days in water of 57° F. and then in water of 158° F.	.....	4,998	1,638	1,239	1,276	1,334

There are various explanations of this peculiar behavior. We will come back to this interesting phenomenon by discussing the reaction of aluminous cements with water. This sharp falling off in strength at higher than normal temperature occurs only when the aluminous cement concrete is cured in water. In dry heat, however, it reserves its remarkable properties. Constructions made in the French possessions in Africa proved to be of excellent durability. This writer, when working in Palestine, a country of semi-tropical climate, had opportunities to examine several aluminous cements of different origin. Laboratory tests as a rule showed very satisfactory results, though the temperature conditions of mixing and curing were not quite favorable. It has often been stressed in the literature that the best results are obtained at temperatures of 50 to 70 degrees F. Our mixing and curing rooms were not air-conditioned and during several months the inside temperature was seldom below 90 degrees F. Nevertheless, no deviations from the normal development of strength or other properties could be observed. Constructions made in summer, when daily temperatures over 100 degrees F. were usual, showed no signs of failures during many years. Piles of reinforced concrete made under the burning sun were removed from the forms 24 hours after placing, and two days later had been driven into the sandy reclamation area. Similar piles made with high-early-strength Portland cement must be cured for the period of two weeks in order to withstand this operation.

Very high dry heat does not affect the binding properties of aluminous cement. It is a well-established fact that, used as a binder of suitable aggregates, it produces a refractory concrete good for service at temperatures of 2,300 degrees F. and higher. The hardened aluminous cement starts to melt at 2,350 degrees F. It is true that its hydraulic binding properties must be destroyed at this temperature, but its binding strengths do not vanish, because before this destruction takes place a new process of hardening is started, a kind of vitrification, similar to that of ceramic material.

The ability of aluminous cement to act as a binder at high temperatures will certainly create a wider market for this product. The advantages are self-evident: furnace walls, for example, may be cast in place; the high early strength allows the application of the full working load 24 hours after placing; the installation of walls without joints results in operating economy, and so forth.

Aluminous cement differs substantially from Portland cement, therefore the usual methods of preparing Portland-cement concrete and mortar can not be blindly applied to aluminous cement. Many failures were caused by this fact. It is, however, difficult to fix general rules for the numerous cases of its application, and still more difficult with respect to different brands of aluminous cement.

It has already been stated that an excess of mixing water strongly affects the development of its strength. For instance, a concrete made with a water-cement ratio equal to 0.7 develops at the age of 24 hours, only two-thirds of the strength of concrete with the ratio of 0.5. However, aluminous cements containing 40 and more per cent. of alumina are less sensitive to an excess of water and are more suitable for poured concrete and grouting. Prolonged mixing is harmful. The producers of American aluminous cement recommend that the time of mixing shall not exceed 1.5 minutes. This writer, however, is aware of facts with respect to other brands, where the increased time of mixing from 2.5 up to 10 minutes resulted in a considerable increase of early strength.

In any case, when working with a definite brand and carefully following the rule for the preparation of matrices of this particular brand extraordinary results will be achieved. I am not referring to the use for some particular purposes only. In this respect aluminous cement is quite indispensable; neither high-early-strength Portland cement nor special cements will produce equivalent results. Despite its price it is of advantage for general construction work in cases when the rate of construction has to be speeded. The development of high early strength allows the dismantling of forms after one day, resulting in a saving of casing material. Considering the fact that after a few days the safety stress is already achieved and depends, not upon the strength of the cementing material, but exclusively upon the yield-point of the reinforcement, insertions of iron can be replaced by those of high-grade steel, thus resulting in a considerable economy regarding the depth of the work, transverse laying of the floors, etc.

Despite the outstanding properties of aluminous cements, the production of them is small in comparison with that of high-grade Portland cement. This is due to the scarcity of bauxites, the only aluminum ore suitable for production of this binding material. France, the greatest producer of bauxite, showed an output of 680,000 long tons in the year 1939. In the same year American production totaled 375,000 long tons, the main source being the mines in Arkansas. Approximately an equal amount has been imported. The greatest part of the produced and imported bauxites has been consumed by the aluminum and chemical industries.

Official statistical data about the production of a luminous cement in this country are not available. The market price of American aluminous cement is high and the difference between its price and that of high-early-strength cement is greater than in Europe. This is apparently due to the higher price of bauxite, and to the existence of but one plant producing this kind of cement, resulting in expensive distribution in a country as big as ours. The high price of aluminous cement naturally limits its use for structural purposes, and, as far as this writer is aware, the greater part of the production in this country is used for refractory and insulating purposes and similar ones demanding a heat-resistant binding material.

The original name of aluminous cement—*ciment fondu,* or fused cement—was derived from the method of its production. As a matter of fact, nearly all countries are applying the melting process in its manufacture. Different kinds of kilns are used: reverberatory open-hearth furnaces, rotary kilns, electric furnaces; for bauxites containing a greater amount of iron blast-furnaces are used, iron being a by-product. The manufacture of aluminous cement, however, does not necessarily require the melting of the raw materials. Bauxites and lime can completely combine when heated at a temperature of about 1,850 degrees F. for several hours, provided that they are ground to a fineness of 7 per cent. residue on the 180-mesh sieve and that the raw meal possesses a very homogeneous chemical composition. An aluminous cement produced by this method in Hungary complies with the requirements regarding the composition and the development of strength.

The chemical composition of aluminous cements varies considerably. Theoretical considerations permit of Al_2O_3 content ranging from 30 up to 70 per cent. The French specification fixes a minimum content of 30 per cent. However, as a rule the existing specifications do not standardize the proportions of the main constituents. The content of magnesia, sulphur tri-oxide, and that of insolubles is limited by some of the specifications.

Regarding the development of strength the demands are relatively high, especially with respect to compression. The Czechoslovakian Standard Specification of the year 1934, for instance, requires for specimens made of standard 1:3 mortar, mixed with 8 per cent. of water and molded with the Boehme hammer:

Water Storage	Compression *(p.s.i.)*	Tension *(p.s.i.)*
1 day	6,350	355
3 days	7,760	400
28 days	9,170	470

The hardening properties of aluminous cements are produced by calcium aluminates. Hence, it has been properly proposed to specify this binding material as *calcium aluminates* cement to distinguish it from Portland cements belonging to the category of *calcium silicates* cements. The commercial product, however, also contains a considerable amount of iron and silica. The general tendency is to use raw materials containing as little silica as possible. The proportion of silica in the various existing commercial aluminous cements usually does not exceed 6 per cent., although there are brands containing up to 10 per cent. The amount of iron in different states of oxidation varies from 5 to 20 per cent., that of lime ranges between 25 and 45 per cent. Besides these oxides and small amounts of magnesia and alkalies, titania is usually found to be present in proportion of about 2 per cent.

With respect to its major constituents the commercial aluminous cement comprises a complex system, $CAO\text{-}Al_2O_3\text{-}Fe_2O_3\text{-}SiO_2$. The knowledge of this quaternary system is not yet sufficiently advanced. The presence of solid solution in aluminous cement increases the difficulties of examination. However, it is generally agreed that, apart from iron compounds, the crystalline ingredients of aluminous cements are presented by mono-calcium aluminate, 5:3 calcium aluminate, di-calcium silicate, di-calcium-alumina silicate (Gehlenite), and 3:5 calcium aluminate. According to the earlier investigations, C_3A_5 will play an important *rôle* in producing the binding strength. Dr. N. Sundius,[11] to whom we owe valuable contributions to the knowledge of aluminous cements, states that he could not establish the presence of this compound, except in negligible proportions. All experts agree, however, that mono-calcium aluminate is chiefly responsible for the development of the early strength of aluminous cements. In his recently-published work F. M. Lea[12] states that 1:3 mortar made with this compound (water-cement ratio equal to 0.6) showed resistance to compression of 8,715, 10,140, 10,770 P. 2.1 at the age of 1, 7, and 28 days respectively. It should be mentioned that Sundius describes an aluminous cement consisting chiefly of 5 CaO. 3 Al_2O_3 in a proportion of about 80 per cent.

This so-called unstable 5:3 calcium aluminate is easily recognized by microscopic examination of thin sections. In commercial cements it exists not as pure compound but contains other compounds in solid solution. The same is to be said of other constituents; the prevalence of solid solutions is characteristic for aluminous cements. With respect to the iron compounds there are no definite results as to their composition. They form the dark ground glass-like mass in which other minerals are embedded. B. Tavasci, who is of the opinion that this ground mass is mainly Fe_3O_4, states, however, that iron also occurs as C_2F, C_4AF, CAF_2 in the form of solid solutions. The presence of iron combinations and the prevalence of solid solutions complicate the application of methods of investigation which proved efficient in studies of the constitution of Portland cement.

More distinct is the interpretation of the hydration process of aluminous cements. It is quite understandable that the studies on the reactions of aluminous cement with water started with the examination of the hydration process of its constituents. It has been assumed that the reactions of anhydrous calcium aluminates are correlated to those of cement. A series of investigations established a more or less close relationship between the reactions of artificially-prepared pure constituents and those of the commercial product, especially when greater quantities of water were used. In practice, however, the hydration of cement takes place with a small quantity of water. The amount of water changes the course of the reactions. With respect to pure calcium aluminates it has been established that the Ca-concentration of the produced solutions is lower and the Al-concentration is greater when the hydration proceeds in the presence of small amounts of water. Besides, other ingredients of commercial cement also influence the course of hydration. The influence of alkalies[13] proved to be of importance, but the other compounds existing in aluminous cement apparently affect the conditions too. These few facts are sufficient to stress the difference between the behavior of pure aluminates and commercial cements. The hydration reactions of the latter necessarily show an analogy with those of pure constituents, but a complete agreement between them does not exist. The changes caused by the com-

plex character of the cements may be far-reaching, nevertheless the hydration reaction of anhydrous calcium aluminates is still the most important evidence for the interpretation of the hydration of aluminous cements.

The most important constituent of aluminous cement is mono-calcium aluminate. At lower temperature it reacts with water, forming mono-calcium aluminate hydrate. At temperatures above 66 degrees F. dicalcium aluminate hydrate and aluminium hydroxide are formed; at still higher temperatures dicalcium aluminate hydrate is transformed in tricalcium aluminate hydrate. This transformation causes the beforementioned decrease in the strength of aluminous cement when cured in water at a higher-than-normal temperature. According to N. Iltchenko and H. Lafama [14] this transformation proceeds as shown in the equation:

$$3\ (2CaO.Al_2O_3.7H_2O) = 2\ (CaO.Al_2O3.6H2O) + 2\ (Al_2O_3.3H_2O) + 3H_2O$$

In the opinion of these investigators the released water provokes a break of continuity in the process of hardening, thus resulting in a rigorous fall of resistance. A few months ago F. M. Lea published the results of his studies on hydration of calcium aluminates and stated that "there is strong evidence that the reduced strength resulting from higher-than-normal curing temperature is caused by the transformation of metastable less basic hydrated calcium aluminates into the tricalcium aluminate hexahydrate."

For a better understanding of the process of hydration we ought to consider it as consisting of two stages. The first stage has chiefly the character of solution; the second one comprises the formation of the hydrated compounds.

In the case of pure calcium aluminates the solution consists of mono-calcium aluminate hydrate with a certain excess of lime. The little excess of lime is necessary in order to make this solution stable. Less basic compounds, like C_3A_5, for instance, must yield their excess of alumina. The latter, in the form of aluminum hydroxide, forms a layer on the surface of the grain subjected to the action of water. This coating acts as a de-activating agent; it makes the further action of water more difficult. Therefore, the compound C_3A_5 reacts slowly with water. Consequently calcium aluminates richer in calcium must react faster. In fact, the compound C_5A_3 reacts very rapidly with water. When the solutions have reached a certain concentration hydration products are precipitated. "When the hydrated solids have been formed, the concentration of the solutions is low and generally decreases to a certain minimum concentration. The later hydration of the clinker grains therefore depends on the reactions in the diffusion layer at the phase-limit. When pure anhydrous compounds are used, the hydration products can be estimated rather easily. On the other hand, the complex system of the technical cement is more difficult to estimate."

The writer does not intend to give a detailed account of the hydration process of the pure compounds. The readers who are interested in the details will find them in the paper presented by Dr. G. Assersson in the Proceedings of the Symposium on the Chemistry of Cements in Stockholm. The few observations mentioned here are taken from his paper.

From a practical viewpoint the reactions of pure calcium aluminates, although important for an understanding of the hydration of aluminous cements, do not mirror those taking place in commercial product. The pure dicalcium-alumina silicate (Gehlenite), for example, reacts very slowly with water. The same compound in the commercial aluminous cement, on the contrary, reacts rapidly.[16] It is well known that dicalcium silicate hydrates slowly. According to Lerch and Bogue, its rate of hydration is about 0.1 per cent. in one day, and much unhydrated material is found after two years.[17] The same compound in aluminous cements hydrates fast and probably almost completely.

The chief reactions of calcium aluminates, however, have always been established in the commercial cements. The principal product is the hydrated monocalcium aluminate gel. The hydration products also include the crystalline dicalcium aluminate hydrate and at higher temperatures the cubic tricalcium aluminate hexahydrate is formed. The latter accounts for the peculiar decrease in strength resulting from water curing at higher than normal temperatures.

In contrast to Portland cement—whose grains hydrate gradually and slowly, so that after a considerable period of time only a part of the cement grain is hydrated—aluminous cement rapidly reacts with water. Most of its grains are transformed into gel. Only the dark glass-like ground mass is not hydrated. This nearly complete hydration of aluminous cement particles is responsible for the development of early strength. The greater proportion of the hydration products consists of gels. According to Kuehl and Berchem, cement clinker containing 7.5 per cent. of SiO_2, 46.8 per cent. of Al_2O_3 and 41.9 per cent. of CaO produced a gel composed of 2.6 per cent. of silica, 59 per cent. of alumina and 38.4 per cent. of lime. The proportions of lime and alumina are in accord with the expected formation of monocalcium aluminate gel, showing an excess of lime amounting to about 6 per cent. An excess of lime is necessary in order to make possible the existence of monocalcium aluminate in solution. The amount of silica, however, does not correspond to the content of this compound in the cement. The data established by Kühl can not be generalized. The character of gels depends primarily on the chemical composition of the cement clinker, but also to a great extent upon the mineralogical structure of it.

The gels are transformed into solid compounds during the period of stiffening and hardening. The character of these transformations is entirely obscure.

References

[1] Jules Bied. *Les ciments a haute teneur en alumine.* Bull. de Soc. d'Encour. p. l'Ind. Nat. Jan., 1923.

[2] Jules Bied. Le Ciment (25), 1920, p. 295.

[3] P. H. Bates. Proc. A.S.T.M., vol. xix, 1919, pt. 2, p. 426.

[4] P. H. Bates. Techn. Pap. No. 197, Bur. of Stand. (1921).

[5] H. S. Spackman. Cement Age, vol. xl, 76, (1910), pp. 76-83.

[6] Lee J. Rothgery. Michigan Eng. Exp. Stat. Bull. No. 4, Jan., 1926.

[7] U. S. Dept. of Agric. Techn. Bull. No. 358, June, 1933.

[8] Pit and Quarry, Jan. 1940, p. 92.

[9] K. E. Dorsch. Concrete and Const. Engineer, July, 1934.

[10] N. Iltchenko and H. Lafama. Chimie et Industrie, vol. 38, Sept., 1937, pp. 438-440.

[11] N. Sundius. Constitution of Aluminous Cement Clinker. Stockholm, 1938.

[12] F. M. Lea. Journ. Soc. Chem. Ind., vol. lix, Jan., 1940, pp. 18-21.

[13] E. Rengade and others. Rev. Mat. Constr. & Trav. Publ., 1936, p. 78.

[14] N. Iltchenko and H. Lafama. *loc. cit.*

[15] F. M. Lea. *loc. cit.*

[16] Ind. Eng. Chem. (1934), 26, p. 837.

[17] Zement. (1932), 21, p. 547.

Recent Activities of Lime Association

Several technical research projects have been carried on by the National Lime Association in coöperation with the National Bureau of Standards and the Massachusetts Institute of Technology. One objective is to further the use of lime in masonry. Luncheon and dinner meetings are held from time to time in leading cities to which are invited architects, contractors, engineers, building officials, and others interested in masonry construction. The association has prepared motion-picture films, charts, booklets, and folders which are sent to vocational instructors.

Other promotional literature is adapted to teaching farmers the fundamentals of applying lime to special types of soil. The association is represented on such technical groups as the American Society for Testing Materials and the American Society of Agronomy.

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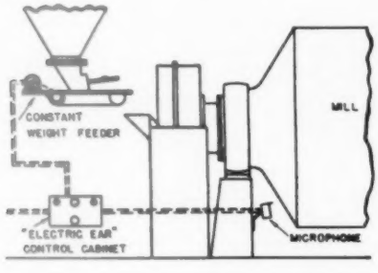

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PERSONAL MENTION

GEORGE W. BALLANTYNE has been named secretary of the Ideal Cement Company, Denver, succeeding the late R. J. Morse. He is 45 years old and joined the company in 1921 as an accountant. Since 1932 he has been assistant secretary and treasurer.

HARRY T. HAWKINS has been appointed sales manager of the Buffalo Gravel Corporation, it was announced by Charles F. Strasmer Jr., president of the company. Mr. Hawkins previously was sales manager of Bray Brothers, Inc., Buffalo, building-supply firm.

CARL R. ROLF has been appointed assistant sales manager of the Pioneer Engineering Works of Minneapolis. Mr. Rolf has been with the company since 1929. ORVAL OHNSTAD has been appointed district sales engineer of Pioneer Engineering Works. His territory will include the Dakotas. Minnesota, Wisconsin, Iowa, Nebraska, Kansas, and Missouri.

K. H. WINTER, who has been representing the Marion Steam Shovel Company in New England, has been transferred to St. Louis, replacing GEORGE DAVISSON. JOSEPH O. REED, sales representative in the Pacific northwest for a number of years, has been made district manager covering the states of Washington, Oregon, Idaho and Montana.

FRANK B. RIDLEY has been made manager of the San Francisco office of the Chicago Pneumatic Tool Company. He succeeds H. P. HANSEN who continues with the company in a sales capacity.

WILLIAM H. MCCONOCHIE was re-elected president at the recent annual meeting of the Rock Island Sand & Gravel Company, Rock Island, Illinois. Other officials who retained their offices were ROBERT F. MCCONOCHIE, vice-president, and H. J. LARKIN, secretary. WILLARD F. LARKIN was elected treasurer, succeeding LEO A. LARKIN.

M. G. LININGER, who is engaged in the sand-and-gravel business at Ashland, Oregon, is erecting a crushing plant at Kerby, Oregon.

R. M. CRAIGMYLE has been elected a vice-president of the Giant Portland Cement Company, succeeding Walter L. Haehnlen, who resigned.

JAMES MCCARTY, purchasing agent and assistant manager of the Alexandria, Indiana, mineral-wool plant of the General Insulating & Manufacturing Company, recently acquired by the National Gypsum Company, has resigned.

JOHN J. PORTER, president of the North American Cement Corporation, addressed the marine section of the National Safety Council at New York recently. His subject was: "A United Front for Safety."

JOHN PRINCE president of the Stewart Sand & Material Company, Kansas City, has been elected president of the Council of Social Agencies of Kansas City. He has been active in the affairs of the council for many years.

P. W. and J. E. PALMER, operators of the Hartland Sand & Gravel Company, Hartland, Wisconsin, have organized a new firm at Oconomowoc, Wisconsin, for the manufacture of metal specialties for the industrial trade.

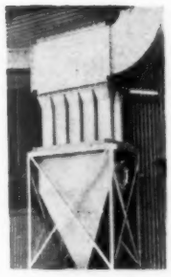
FREDERICK C. BRYAN, for thirty years general traffic manager of the Allis-Chalmers Manufacturing Company, died at his home in Milwaukee, April 7 as the result of a heart attack.

EDWARD GRAHAM, 59, plants superintendent of Graham Brothers, Inc., large-scale aggregate producer in the Los Angeles area, died recently at his home in Long Beach, California. He leaves the widow and one brother, Paul, president of the corporation.

EDWARD O. BANKER, 67, general superintendent of the Pennsylvania Glass Sand Company, died at his home at Huntingdon, Pennsylvania, on March 10. He was in charge of operations at the company's plants in West Virginia, Missouri, Maryland, New Jersey and Pennsylvania.

WILLIAM R. OGLESBY, 65, vice-president and chief chemist of the Carney Company and Carney Rock Wool Company, Mankato, Minnesota, died recently after being suddenly stricken with a heart ailment.

WILLIAM MEYER, 83, retired businessman and former partner in the Rockwood Lime Company, died March 12 at the home of his daughter in Pewaukee, Wisconsin, following a brief illness. Mr. Meyer was formerly associated with Henry Oestreich in the lime company at Rockwood, Wisconsin. He is survived by his wife, three daughters and two sons.



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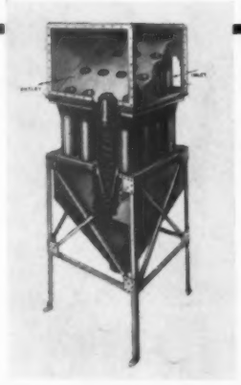

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OCCUPATIONAL DISEASES and the LAW

Truck Washer

Moore v. Colonial Sand & Stone Company, et al., decided by the New York Supreme Court, Appellate Division, Third Department, January 15, 1941; reported at 24 N.Y.S. (2d) 751.

This decision affirms an award of disability compensation made by the State Industrial Board pursuant to the provisions of the Workmen's Compensation Law. The employer was engaged in the building-material business and the maintenance and operation of trucks. The claimant was a truck washer. The Industrial Board found that he became disabled from a pulmonary tuberculosis, an occupational disease which he contracted due to the nature of his employment. In washing and greasing the trucks the claimant worked continually around water in the garage in which there was no heat, doing the same work at night, when he had to get under the trucks with nothing to put under him. The evidence showed a natural progression from these exposures to the development of the tuberculosis and the medical proof was to the effect that the disease was caused and aggravated by the occupation.

Insurance

Lanzetta v. Allied Decorating Company, Inc., et al., decided by the New York Supreme Court, Appellate Division, Third Department, January 15, 1941; reported at 24 N.Y.S. (2d) 829.

The workman involved in this case contracted dermatitis venenata, an occupational disease, about a week after he began work on April 24, 1939. The disease became progressively worse until October 19, 1939, when he became disabled. At the time the disability began on October 19, the employer was insured by the Associated Indemnity Corporation. Before that time and in May, 1939, when the disease was contracted, the employer had been covered by the State Insurance Fund. The court holds that the award of compensation which is the subject of this appeal was properly made against the company which insured the employer at the time the disability began (Workmen's Compensation Law, Sec. 38; *Larkow v. Standard Mirror Company et al.,* 251 App. Div. 762, 295 N.Y.S. 524).

Silicosis

Foote v. Hecla Mining Company, decided by the Supreme Court of Idaho, December 10, 1940; reported at 108 Pac. (2d) 1030.

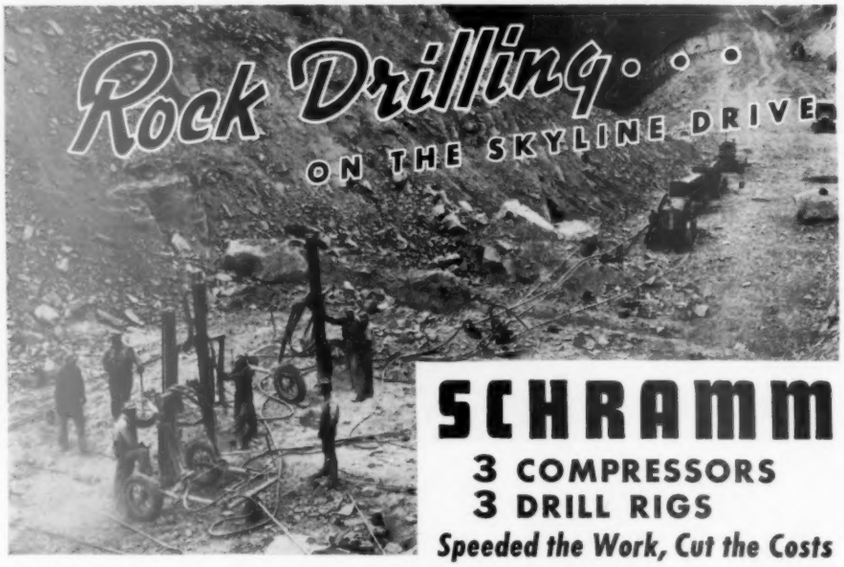
This case involved a workman's compensation claim on account of a miner's death from silicosis and, because the exposure was before the enactment of the Idaho occupational disease legislation (Chapter 161, Idaho Session Laws of 1939), the case had to be decided as the law stood prior to the adoption of that act. Under the law then existing compensation was not payable when silicosis was an occupational disease, but only when it was contracted by accident. The facts in this case show that silicosis was contracted as an occupational disease, and compensation can not be allowed.

FOREIGN PRACTICE

Economical Grinding

J. Hodel discusses the proper selection of the reduction machine and its arrangement in closed circuit with a screen. Industrial reduction, and especially in the cement, lime and gypsum industries, is divided generally into coarse or primary crushing and fine grinding. The coarse or primary crusher reduces to a granule size of 30- to 50-mm. edge length, and the fine mills reduce the crushed material to a fine flour with finenesses having but a few per cent. residue on the 900-, 4,900-, and 10,000-mesh per sq. cm. screens, depending on their intended use. Between these two reduction stages products are made with finenesses in which the maximum granule is within 1 and 4 mm. Applications in coarse grinding include the grinding of agricultural lime, the preparation of raw gypsum for burning in gypsum kettles, the grinding of coke and coal for the burning of cement clinker in shaft kilns and sinter-grate apparatus, etc., also the primary reduction of cement clinker and cement raw materials.

The aim in primary grinding is to obtain the most uniform granular composition, with the least amount of fine granules, so as to minimize grinding costs and assure the maximum application quality of the product. For this purpose the fine-grinding machines are unsuitable, including the ball-mills



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with air-sifters, tube-mills with air-stream sifters and compound mills, for they produce too many fine granules. Machines well suited to coarse grinding include principally the roller-mills, hammer-mills, and screen ball-mills. For extensive primary reduction of the cement raw materials (especially hard limestone) and cement clinker a special design of crusher, namely the Symons granulator, has been introduced, producing a granule of 2 to 3 mm.

Grinding tests were conducted using medium-hard limestone of 3 to 40-mm. granule size to be reduced to about 3 mm. maximum granule size. The results are shown below, the units Nos. 2, 3 and 4 working in a closed circuit with bucket-conveyors and screens, and the material in Unit No. 1 being passed repeatedly through the mill:

Comparing the results indicates that the granulator yields the least amount of minimum-size granule and that it gives an especially high specific grinding output. It is indicated also that an extensive primary reduction of the raw material to about 2 to 3 mm. effect gives a considerably increased output of the connected fine-grinding plant. While the installation of a granulator increases the power requirement of the raw-flour plant about 10 per cent., the output of the total plant is increased a considerable percentage above it.

However, in primary grinding the granulators and screen ball-mill are more sensitive to moisture of undried raw materials than the hammer-mill and roller-mill. On the other hand, the wearing effect in the primary grinding of the hard and sintered materials (hard-limestone clinker) upon the grinding agents is greater in the hammer-mill than in the granulator. Furthermore, raw materials which lose their form to a certain extent before being reduced in size, or substances which tend to stick together—as, for example, soft limestone and settled burned lime—are difficult to handle in smooth-roll mills and granulators, for individual pieces are pressed flat and in many cases briquettes are formed by the meal and grits being pressed together,—so that in this case a hammer-mill is better suited because it exerts a loosening action on the material. As to the weight of the material and its relation to the purchase price of the machine, in some respects the hammer-mill with a welded housing has an output of about 2.5 tons per hour related to 1-ton machine weight, whereas the corresponding value for the screen ball-mill is about 0.6 tons per hour.

Considering these points, the individual primary grinding material can best be handled in the following grinding machines: agricultural lime (burned

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lime and lime marl), raw gypsum and coal in hammer-mills; coal and coke in roll-mills; burned lime for agricultural purposes (especially when very hard) in screen ball-mills; hard limestone and cement clinker in granulators. In case of doubt grinding tests should be made before selecting a machine.

Another method of meeting the requirement of producing a primary grinding product in which the maximum (oversize) granule does not exceed a definite amount and in which the content of minimum-size (undersize) granules is as small as possible is the arrangement of a reduction machine in closed circuit with a screen installation. The ground material leaving the mill is passed to the screen, the throughs passing to a hopper and the tailings passing back through the mill, and so on. This arrangement eliminates oversize in the finished product; and if fine material is present in the raw material before passing to the mill, it can be passed first through a screen; and there is less minimum-size (undersize) granules in the finished product, and the output of the entire plant is increased.

Comparative test data obtained in a hammer-mill grinding lime marl for agricultural use is presented by the author, which shows the favorable effect of interscreening the material being ground upon the granule composition of the finished product and upon the grinding output. The hammer-mill was required to grind air-dry soft lime marl sized up to 60-mm. edge length, reducing it to 80 per cent. passing through DIN screen No. 8 (0.75-mm. openings) and the remainder passing through DIN screen No. 3E (2-mm. openings). The fine material of 0 to 2 mm. was removed from the raw lime before the test. In Test I the hammer-mill operated without intermediate screening and with a grate opening of 2.75 mm., and in Test II it operated in closed circuit with bucket-elevators and a screen and a grate opening of 5 mm., the raw material being fed into the circuit on the screen to eliminate the fines. In Test II the grinding output was about 20 per cent. higher than in Test I. In Test I the hammer-mill delivered an output of 4,500 kilogram per hour and required 25 horsepower, making a specific output of 180 kilograms per horsepower-hour. In Test II the hammer-mill delivered an output of 5,400 kilograms per hour, and required 25 horsepower for the mill and 2 horsepower for the screen plus 1 horsepower extra for the bucket-elevators, or 28 horsepower total, making a specific output of 193 kilogram per horsepower-hour. The specific delivery per horsepower-hour was increased, therefore, about 7 per cent.—*Tonindustrie-Zeitung*, vol. 65, (1941), no. 2, pp. 17-18; no. 4, pp. 37-39.

SCREEN ANALYSIS OF THE PRODUCT

No.	Reduction Machine	Per Cent. Residue on Test Screen (*mesh width in mm.*)									Specific Grinding Output (*kg. per hp. per hr.*)
		0.15	0.3	0.5	0.75	1	1.5	2	3	4	
1	Screen ball-mill	79.5	67.2	59	50.1	40	25.9	12.4	0.3	0	180
2	Double-roll mill (smooth rolls)	78.0	69.8	61.6	50.6	38.1	21.2	7.5	0.2	0	190
3	Hammer-mill	79.8	73.3	65.6	54.9	43	26.5	10.2	0.2	0	220
4	Granulator	83.2	76.9	69.7	59.7	46.9	27.5	9.4	0.2	0	360

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Reduction Machine	Per Cent. Residue on Test Screen (*mesh width in mm.*)								Specific Grinding Output (*kg. per hp. per hr.*)
	0.15	0.3	0.5	0.75	1	2	2.75	4	
Double-roll mill (smooth rolls)	84	77	71	64	55	31	8	0	200
Granulator	88	82	77	71	64	36	10	0	375

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I.C.C. Decisions

Sand, Gravel and Crushed Stone—In a hearing before Examiner R. G. Taylor at Chicago, March 21 in fourth section application No. 18857 (sand, gravel, and crushed stone to Illinois) R. A. Sperry, publishing agent, and William Gray, chairman, shortened procedure committee on sand, gravel and crushed stone for the Illinois Freight Association, testified in support of fourth section relief on carload movements of the commodities mentioned from Dickason, Cayuga, Riverton, Standard Pit, and Terre Haute, Indiana, to petroleum producing points in Illinois in the Centralia district. They said approximately 5,000 tons of the three commodities were destined for shipment and they asked for relief to prevent rate reductions which might break up existing rate relations in Illinois and Indiana.

Under the proposal, the present rate from Riverton, Indiana, to Alma, Illinois, for example, would be reduced

from 99 cents to a new rate of 76 cents, the highest rated intermediate point, Kimondy, Indiana, to take a rate of 99 cents. The witnesses sought to show the rates would not be prejudicial to intermediate points and would prove sufficiently compensatory. The proposed rates were contained in the Chicago and Eastern Illinois tariff 505-C I.C.C. 510, and the Illinois Central tariff I.C.C. A-10441, and would not become effective until the Commission decides in the matter. No opposition to the proposed rates was voiced at the hearing.

Cement Rates—The Commission, by division 4, in No. 22020, Iola Cement Mills Traffic Association *et al., vs.* Atchison, Topeka & Santa Fe. *et al.,* on petition of the defendants, has amended the second ordering paragraph of its order of February 14, 1931, as amended.

As amended, the defendants, so far as they participate in the transportation, are required to establish on or before March 5, 1934, on 30 days notice, and thereafter to maintain and apply rates and charges on cement, carloads, from Portland and Boettcher, Colorado, and Laramie, Wyoming, to destinations described in the report, other than Denver, Lowry, Remaco, and Sandown, Colorado, and destinations within 80 miles (highway distance) from Boettcher, Laramie, or Portland, which shall not be less than the contemporaneous rates maintained on the same traffic from Chanute, Fredonia, Humboldt, Independence, Iola, and Mildred, Kansas; and Dewey, Oklahoma, to the same destinations by a greater amount than would obtain by the application from the respective origins to the aforesaid destinations of an average of scales 3 and 4, prescribed in Western Cement Rates, 48 I.C.C. 201, 69 I.C.C. 644.

Granite, Marble and Stone—The Commission, by division 2, in fourth section application No. 18326 (stone, Elberton, Georgia, group to Missouri and Kansas, by fourth section order No. 14146) has authorized carrier's railroads, parties to Kipp & Peel tariffs to establish rates on granite, marble or stone from Elberton, Georgia, and other points in Georgia and Alabama to Kansas City, Atchison and Leavenworth, Kansas, and St. Joseph, Missouri, and Fort Scott, Kansas, and Carthage, Missouri, without observing the long and short haul provisions of section 4, subject to the 50 and 33⅓ per cent. circuity limitation rule.

However, authority has been denied to establish rates on like traffic from Memphis, to Kansas City, Atchison and Leavenworth, Kansas, and St. Joseph, Missouri, without observing that part of the law. The rate authorized from the Elberton group to Kansas City, Atchison, Leavenworth, and St. Joseph

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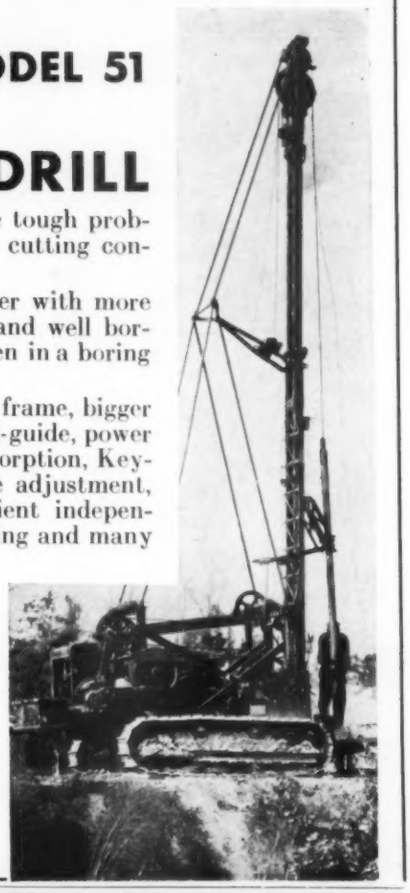

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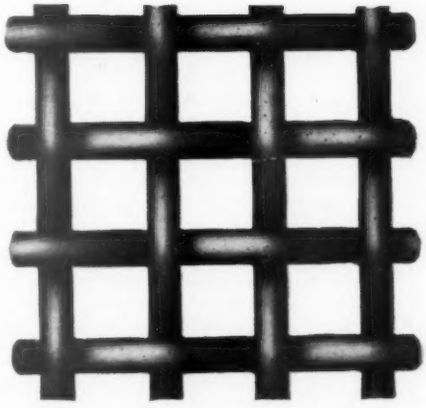

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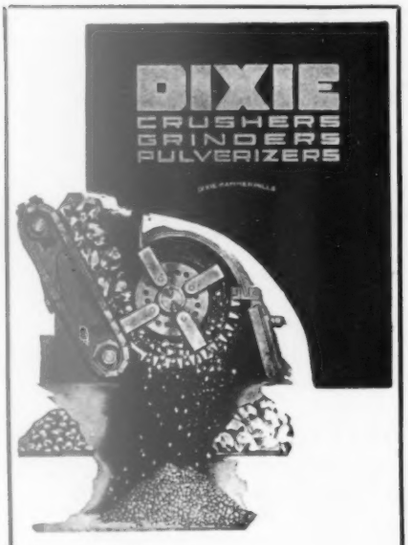

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was $7.53 a net ton and to Fort Scott and Carthage, $7.93.

Phosphate Rock—The Commission, division 3, has dismissed No. 27723 (Phosphate Export Association, *et al. vs.* Atlantic Coast line *et al.)*, finding that rail rates on phosphate rock, from Florida origins to Tampa and Port Tampa, for ocean shipments beyond, and terminal service charges at those ports had not been shown to be unreasonable. The report was written by Commissioner Patterson and Commissioner Alldredge noted a concurrence in the result.

The rates in question apply on shipments from the drying plants of the producers of the rock, and they apply not only to Tampa and Port Tampa, but to South Boca Grande as well. It was stated by the complainants that they did not need the facilities at the last mentioned port, but according to the report, they did not advocate abandonment. The haul to South Boca Grande is considerably longer than to the other ports.

Commissioner Patterson found such wide variances and discrepancies in cost data that he definitely rejected the cost study of the complainants and fell back for disposition of the matter on the fact that the rates in question had been maintained without change except such as caused by general increases, for about thirty years. He found that the parties were at variance even as to valuation figures taken from the same source, and he also found a variance as to out-of-pocket expenses; also lack of agreement as to the sort of averages to be used. Commissioner Patterson said that even though the South Boca Grande situation and the wet-rock movement be eliminated from consideration, the record was not convincing that the rates and charges exceeded the maximum limit of reasonableness. The carriers said the ports should be equalized. The present rate of 68 cents a gross ton was established in 1922 and increased ten per cent. in 1938.

Fourth-Section Applications

Docket 18956—Filed by Roy Pope requesting fourth section relief to establish rates on clay, kaolin or pyrophyllite, carloads, from Causey, North Carolina, to points in official territory to meet market competition.

Docket 18962—Filed by R. A. Sperry requesting fourth section relief to establish rates on crushed stone and gravel, carloads, from Cayuga, Kern, Terre Haute, Greencastle, and Riverton, Indiana, to Charleston and Mattoon, Illinois, to meet market competition.

Docket 18981—Filed by W. S. Curlett requesting fourth section relief to establish rates on cement, in carloads, from Buffalo and Hudson, New York, to points in official territory located in Virginia and North Carolina circuitous routes and to apply over short tariff routes. Rate constructed on the basis of the short line distance formula being the grounds for relief.

Docket 18995—Filed by B. T. Jones requesting fourth section relief to establish rates on crushed stone, carloads, from Chicago, Illinois, rate points and Joliet, Illinois, to Kingsbury, Indiana, circuitous routes being the grounds for relief.

Fourth-Section Orders

Docket 13784—(3rd supplemental) Sand, crushed stone, and gravel to Valparaiso, Indiana. Applications 18296 amended, and 18500 filed by B. T. Jones. Fourth section order 13784 entered April 1, 1940, in application 18296 amended as modified and amended by supplemental orders entered therein from time to time which by its terms expires April 20, 1941. Further modified and amended so as to provide that the relief authorized therein shall continue until August 20, 1941.

Docket 14152—Sand and gravel, from South Beloit, Illinois. Application 18838 as amended, filed by C. & N. W., C., M., St. P. & P. and C., St. P., M. & O. Until the effective date of the order or orders to be entered following further consideration of Fourth Section Application 18838, as amended, applicants authorized to establish and maintain over existing routes on sand and gravel, in carloads, minimum weight 90-per cent. of the marked capacity of car except that when car is loaded to full visible capacity actual weight but not less than 40,000 pounds will be the minimum from South Beloit, Illinois, to Camp Douglas and Oshkosh, Wisconsin. Rates not less than 90 and 83 cents per ton, respectively, and to maintain higher rates to intermediate points provided that rates to such higher-rated intermediate points shall not be increased except as authorized by this Commission and shall not exceed the lowest combination of rates subject to the Interstate Commerce Act.

Central Freight Association

Docket 66310—(Shipper's proposal) Cement, viz.: Common, hydraulic, masonry, mortar, natural or Portland, carload, minimum weight 50,000 pounds, unless marked capacity of car is less, in which case marked capacity of the car will be the minimum weight, but not less than 40,000 pounds. Establish on Middle Branch, Ohio, to Argos, Dillon, Kingsbury. Lakeville, LaPaz Junction, LaPorte, North Liberty, Pine, Plymouth, Stillwell, Walkerton, Indiana, 17 cents.

Docket 66314—(Shipper's proposal)

Sand and gravel, carload. Amend Note 1, page 11, C. F. A. L. Tariff 575-A, in connection with Items 210 to 472 of the tariff, publishing rates on, from various points in Kentucky, Ohio, and Indiana to various points in Official territory, by providing for the addition of "Beaver, Ohio," as an origin station located in the Coalton, Ohio, group.

Docket 66368—(Carrier's proposal) Limestone, ground or pulverized carload, minimum weight 60,000 pounds. Establish on, from Louisville, Kentucky, to Charleston, Indiana, 77 cents per net ton, *via* B. & O. R. R. direct.

Docket 66512—(Shipper's proposal) Limestone, agricultural, unburnt and screenings, agricultural limestone in bulk, in open top cars, carload. Establish on, from Spore, Ohio, to Charlestown, Ohio, $1.27 per net ton, *via* N. Y. C., Fostoria, Ohio, B. & O. R. R.

LABOR DECISIONS

Election

Marlin-Rockwell Corporation v. National Labor Relations Board, decided by the U. S. Circuit Court of Appeals, Second Circuit, January 6, 1941; reported at 116 Fed. (2d) 586.

While this case arose on petition to set aside a cease-and-desist order of the National Labor Relations Board, the real question for decision was the validity of an election whereby a union was designated as collective-bargaining agent for the petitioner's employees. The court holds that the board did not act arbitrarily in excluding minor apprentices from the election; that the board did not abuse its discretion in refusing to allow a representative of the company to be present at the election, since the manner in which an election shall be conducted is within the discretion of the board; that employees who had been laid off for lack of work had not been "discharged for cause" and were properly included in the election; and that the election was effective in spite of the fact that a majority of those participating in the election was not a majority of the employees entitled to vote. The election was therefore valid and a cease-and-desist order based upon the company's refusal to recognize the union as the bargaining agent of its employees will be enforced.

Processing

National Labor Relations Board v. Crystal Spring Finishing Company, decided by the U. S. Circuit Court of Appeals, First Circuit, January 7, 1941; reported at 116 Fed. (2d) 669.

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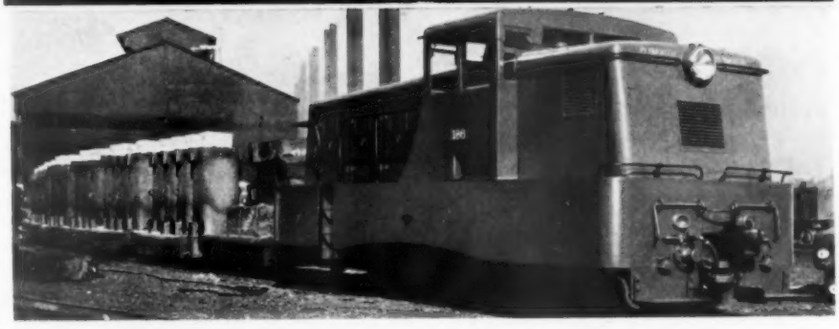

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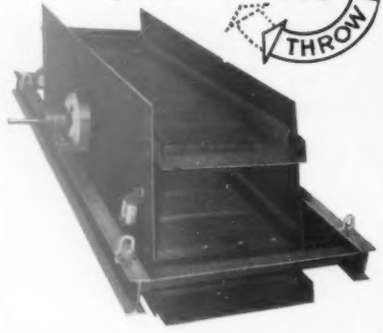

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The respondent company claimed exemption from the National Labor Relations Act on the ground that it merely processed textiles to which its customers retained title, and which its customers delivered to it and transported away when completed. The court holds, however, that a substantial amount of interstate commerce is involved which would be injuriously affected by a strike of the processor's workmen, and that the National Labor Relations Act applies. "It is unimportant that the respondent's finishing operations were performed upon goods belonging to others who furnished their own transportation."

An order of the board requiring the respondent to cease and desist from certain unfair labor practices is held to be supported by substantial evidence. In particular, "the board was justified in its conclusion that the announcement of a permanent shut-down and payment of the employees three days before the regular pay day was part of an effort by the respondent to discourage union activity, to an extent prohibited by the act."

Representation

McQuay-Norris Manufacturing Company v. National Labor Relations Board, decided by the U. S. Circuit Court of Appeals, Seventh Circuit, December 23, 1940; reported at 116 Fed. (2d) 749.

The petitioning company (seeking to set aside an order of the National Labor Relations Board) recognized a union of some of its employees as the sole collective-bargaining agency for those employees who are affiliated with the union. The court rules, however, that the words "for those employees who are affiliated with the union" place a limitation upon the recognition granted which can not be reconciled with the plain language of the statute. The recognition required by Section 9 (a) of the National Labor Relations Act "is not a bargaining matter." When the union disclosed to the employer that it represented a majority of the employees in the appropriate unit, "the obligation was then fixed upon it [the employer] to recognize the local as the sole and exclusive bargaining agent, not only for the members of the union, but for all employees." In the view of the court, "there could be no genuine bargaining as contemplated by the statute until complete recognition had been granted as the act requires."

The board's order requiring the employer, upon request, to bargain with the union as exclusive representative in the appropriate unit and to embody any understanding reached in a signed agreement will be enforced.

Checkoff

National Labor Relations Board v. West Kentucky Coal Company, decided by the U. S. Circuit Court of Appeals, Sixth Circuit, November 15, 1940; reported at 116 Fed. (2d) 816.

The order of the National Labor Relations Board reviewed here required the respondent company to dis-establish and withdraw recognition from an association as representative of its employees; to reimburse its employees for all the deductions made from their wages for the association dues or assessments since a stated date; to reinstate, with back pay, five employees found to have been unfairly discharged; and, upon request, to bargain collectively with a named outside union in the event that it were certified as the exclusive bargaining representative after an election ordered by the board. The portions of the order requiring the disestablishment of the association (because of its domination, etc., by the employer) and the reinstatement of five employees with back pay are found to be supported by the evidence and will be enforced. The portion relating to the refunding of dues checked off and paid to the association, however, will not be enforced; the court holds that such a refund is not authorized by the National Labor Relations Act, and, since it would order the employer to restore money paid to another, would violate the fundamental principles of equity. Furthermore, since there was no finding that the employer had refused to bargain collectively, the portion of the order requiring the bargaining, at some future date, with a representative to be chosen at an election not yet held, will not be enforced.

Jurisdiction

National Labor Relations Board v. Gulf Public Service Company, decided by the U. S. Circuit Court of Appeals, Fifth Circuit, January 8, 1941; rehearing denied February 1, 1941; reported at 116 Fed. (2d) 852.

It was argued that the employer involved here was not subject to the jurisdiction of the National Labor Relations Board because its business is almost entirely intrastate and that disturbances in connection with its business could have but little direct effect on interstate commerce. The court holds, however, as did the board, that the National Labor Relations Act extends to any and all enterprises, without regard to their magnitude, in which labor troubles might reasonably be said to have the probable effect of directly interfering with the free flow of *any* interstate commerce. "Congress, in short, in entrusting the enforcement to the

wise discretion of the board, spoke not quantitatively or fractionally, or in terms of degree, but qualitatively and in comprehensive terms."

An order requiring the employer to bargain collectively, upon request, and to reinstate certain employees will be enforced.

Domination

National Labor Relations Board v. Swift & Company, decided by the U. S. Circuit Court of Appeals, Eighth Circuit, November 20, 1940; reported at 116 Fed. (2d) 143.

In this decision the appellate court upholds an order of the National Labor Relations Board requiring the employer, among other things, to withdraw recognition from an association of its employees. Formerly there was an organization of employees in which half of the members of its representative body were chosen by the employer. The employer posted a notice that, as the Supreme Court had construed the National Labor Relations Act, it was not possible to continue the organization. The court holds, however, that there was evidence to justify the board's finding that full freedom was not returned to the employees. "Only a few days intervened between the respondent's posting its declaration of the impossibility of continuing the old organization and the completion of the new organization and the recognition thereof by the employer. The facts found by the board upon substantial evidence sufficiently sustain its finding that there was a material degree of interference and domination on the part of the respondent in the formation and administration of the new labor organization."

Various procedural points raised in the appeal are also decided against the employer.

Barges

Gale et al. v. Union Bag & Paper Corporation, decided by the U. S. Circuit Court of Appeals, Fifth Circuit, December 11, 1940; reported at 116 Fed. (2d) 27.

This decision, affirming the District Court's decision in *Lowrimoore v. Union Bag & Paper Corporation*, 30 Fed. Supp. 647, holds that employees working as barge tenders on barges engaged in commerce upon navigable waters of the United States, performing the services usual to their occupation, such as attending to the lines and anchors, putting out running and mooring lights, pumping out bilge water, etc., are "seamen" expected from the provisions of the Fair Labor Standards Act of 1938 (29 U.S.C.A. Sec. 213(a)(3)). It is immaterial, says the court, that the vessels were without motive power. "It is apparent that the barge men rendered services of a maritime character. . . . We consider that, both from the letter and the intention of the act, it is clear employees of this character, ordinarily to be considered seamen, were excepted from its provisions."

Protection

National Labor Relations Board v. General Motors Corporation, decided by the U. S. Circuit Court of Appeals, Seventh Circuit, December 12, 1940; reported at 116 Fed. (2d) 306.

The employer here involved maintained that an order against it under the National Labor Relations Act was not supported by substantial evidence (which is decided against it in this appeal), that the board's order requiring it to provide reasonable protection from physical assaults and threats of violence for its employees was not proper; and that an agreement between the employer and a union precluded the board from issuing the complaint on which the order is based. All these questions are decided against the employer in this appeal.

The court rules that the "reasonable" protection required by the order

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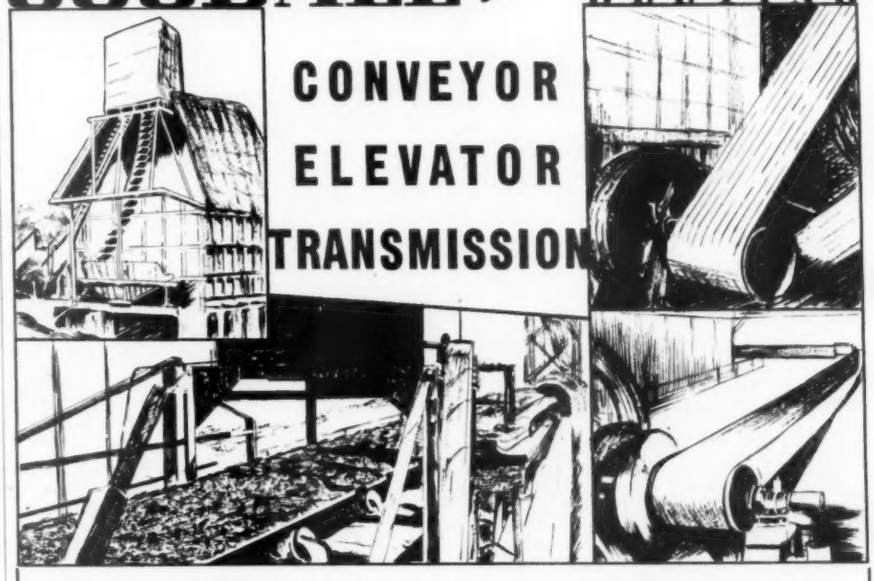

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will be given when the employer maintains order and discipline characteristic of a well-run manufacturing plant and, in good faith, takes the position that its employees may freely choose their bargaining agent. "The term, 'reasonable' is somewhat relative but not so uncertain that respondent can not comply with the board's order."

Election

National Labor Relations Board v. Automotive Maintenance Machinery Company, decided by the U. S. Circuit Court of Appeals, Seventh Circuit, December 12, 1940; reported at 116 Fed. (2d) 350.

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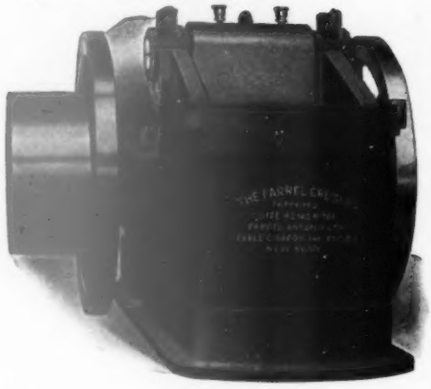
Complete plants designed and equipped, including Screens, Elevators and Conveyors. Machinery for Mines and Rock Quarries, Sand and Gravel Plants. Engineering Service



EARLE C. BACON, Inc.

17 John St. New York, N. Y.

After a majority of the employees of the respondent company had voted in favor of an inside union rather than an outside union, an association of the employees was formed and negotiated an agreement with the employer. The order of the National Labor Relations Board, which the board sought in this action to enforce, required the company to withdraw recognition from the association. The court concedes that it may be true that the employer's permission to use the factory as a meeting place and its failure to dock employees for 15 minutes of company time used for business of the association was an "unfair labor practice," but refuses to enforce the board's order because of the freely and frankly expressed wish of the majority of the employees as to union preference. By eliminating the local union and limiting the candidate for employees' choice to one the board in fact, says the court, selects the union for the employees, which was not the purpose of the act. The withdrawal of recognition from the union preferred by a majority of the employees could only be justified, in the court's opinion, "on the theory that the contest is one between the employer and the rejected union," in which the wishes of the employees count for nought.

Two employees discharged for unlocking a door and admitting a union organizer to the factory are held not to have been discharged for "union activities," contrary to the National Labor Relations Act.

Penalties

Divine v. Levy et al., decided by the U. S. District Court, Western District of Louisiana, Shreveport Division, December 13, 1940; reported at 36 Fed. Supp. 55.

The plaintiff sued under the Fair Labor Standards Act of 1938 to recover compensation claimed to be due under the minimum-wage provisions of that act, together with an additional like amount as liquidated damages provided for in the act, and furthermore for the continuous payment of his claimed weekly wage from the date he made demand on the employer until eventually paid — the latter claim based on a Louisiana state law (Act 150 of 1920, as amended by Act 138 of 1936) which provides a continuous penalty to accrue against the employer when immediate payment of a laborer's wage is not made upon demand. The court holds, however, that when an employee enters court under the Federal act, he should not be benefited additionally with whatever penalties the Louisiana statute may accord him. Furthermore, the penalty under the state law applies only when the employer does not pay "the amount due under the terms of the employment"; in this case, the additional amount the employee asked for was what the Federal statute accorded him, and was never a part of his "terms of employment."

Certain defendant parties are dismissed from the suit on the ground that their only relation to the property where the plaintiff worked was the ownership of an "overriding royalty," and that they did not come within the meaning of "employer" as defined in the Fair Labor Standards Act.

Minority Union

Florsheim Shoe Company, Inc., et al. v. Retail Shoe Salesmen's Union of Brooklyn and Queens Local 287 et al., decided by the New York Supreme Court, Special Term, Kings County, December 21, 1940; reported at 24 N. Y. S. (2d) 923.

A temporary injunction to prevent picketing of the plaintiff's place of business is granted on the ground that a closed-shop contract was signed with another union which had been designated as bargaining representative of the employees, and that under the circumstances, there is no "labor dispute." Orders of the State Labor Relations Board for the election and certifying of the successful union have not been appealed and are in full force, and certain charges of unfair labor practices have not yet been heard; on a hearing of those charges the board may grant such relief as the situation may warrant.

Independent Union

E. I. du Pont de Nemours & Company v. National Labor Relations Board, decided by the U. S. Circuit Court of Appeals, Fourth Circuit, December 27, 1940; reported at 116 Fed. (2d) 388.

In this review the court grants a petition of the employer to set aside an order of the National Labor Relations Board requiring it to disestablish an independent union of its employees. Al-

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FULL FLOATING CIRCLE THROW SCREEN

Coarse and Medium Sizes
Live Rubber Mountings
No Escaping Vibration

HIGH TONNAGES OF ROCK

The W. S. Tyler Company

CLEVELAND, OHIO, U. S. A.

though the union was formed as a successor of employee organizations which did not meet the requirements of the National Labor Relations Act, the court holds that notices of the company's impartiality which were posted by the employer were frank and clear statements of the company's policy of not interfering with the employees in their self-organization, and that the evidence does not show any domination or interference of the new organization by the employer.

The court construes the claims of the board in this case as alleging a power of the board to test the practical effectiveness of a labor organization even though the organization be admittedly free from employer domination or interference. The court "can find no basis in any section of the act for the power thus claimed." Rather, it agrees with the opinion in an earlier decision that "the board is not made either guardian or ruler over the employees, but is only empowered to deliver them from restraint at the hands of the employer when it exists" *(Humble Oil & Refining Company v. National Labor Relations Board,* 113 Fed. (2d) 85, 88.).

Discrimination

Burrow v. Kapfhammer, decided by the Court of Appeals of Kentucky, December 13, 1940; reported at 145 S.W. (2d) 1067.

The General Assembly of Kentucky at its 1940 session enacted "An act relating to employer-employee relations," Chapter 105, codified as Sections 1599c-4 to 1599c-40 of Baldwin's 1940 Supplement to Carroll's Kentucky Statutes. In this suit, the trial court (the Circuit Court for Franklin County) ruled that all of Section 17 of the Act, requiring the payment of time and a half for the time worked on the seventh day of a week, was invalid because of discriminations resulting from arbitrary classifications in the employments excepted from the provisions of that section. The Court of Appeals, however, rules that that decision was too broad; that the act is invalid as applied to the plaintiff (appellee), who operates an independent restaurant, because of the discrimination arbitrarily created by exempting employees doing similar work in hotels; but that there is no reason for going beyond that, and that the act is possible of enforcement after recognition of its invalidity as applied specifically to independent restaurants. The lower court's declaration that Section 17 is invalid in its entirety is, therefore, modified accordingly.

The Union Wire Rope Corporation recently opened a new Chicago office and warehouse at 111 North Canal Street.

NEW MACHINERY and SUPPLIES

• Excavator

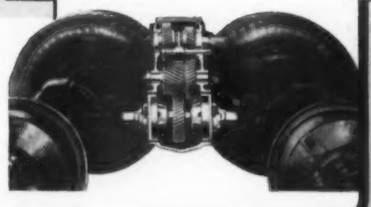
The Trackson Company of Milwaukee has just announced the addition of a new model to its popular line of Traxcavators. This new machine is said to be the biggest, most powerful tractor shovel ever built and is known as the Model T 7. It is available with 2 or 2½ cubic yard bucket and answers the repeated demands for a bigger unit capable of handling any type of digging, dirt-moving or material handling with ease, speed and at low cost.

Mounted on the Caterpillar D 7 tractor, the T 7 Traxcavator is truly a giant in size and power. In addition, its versatility and multi-purpose utility make it profitably useful on a wide variety of digging, loading, grading and dirt-moving operations, not only as a shovel and loader, but also as a scraper, bulldozer, anglegrader and trail-builder.

The full 23,000-pound push of the tractor can be applied to the bucket to penetrate and dig. In spite of its large size and tremendous power, it is fast, mobile and agile. It travels around the job at speeds up to six miles per hour, turns in its own tracks, and has a remarkably fast loading cycle for a machine of its size. The tractor is equipped with extended track frames and specially fitted to provide sta-

HAUL BIGGER LOADS

GET MORE TRACTION



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For real pulling power TWO driving axles under the load are far better than one.

With the THORNTON four-rear-wheel DRIVE, in addition to increased capacity and traction you get more flexible operation since you have two transmission ratios—one for power and one for speed. Your investment in equipment is 25 to 40% less, your operating and upkeep costs are from 30 to 50% lower. With THORNTON "Walking-Beam" spring design less shock reaches vehicle and load.

We can show you how to save with a truck equipped with THORNTON four-rear-wheel DRIVE. Users in scores of industries are lowering costs.

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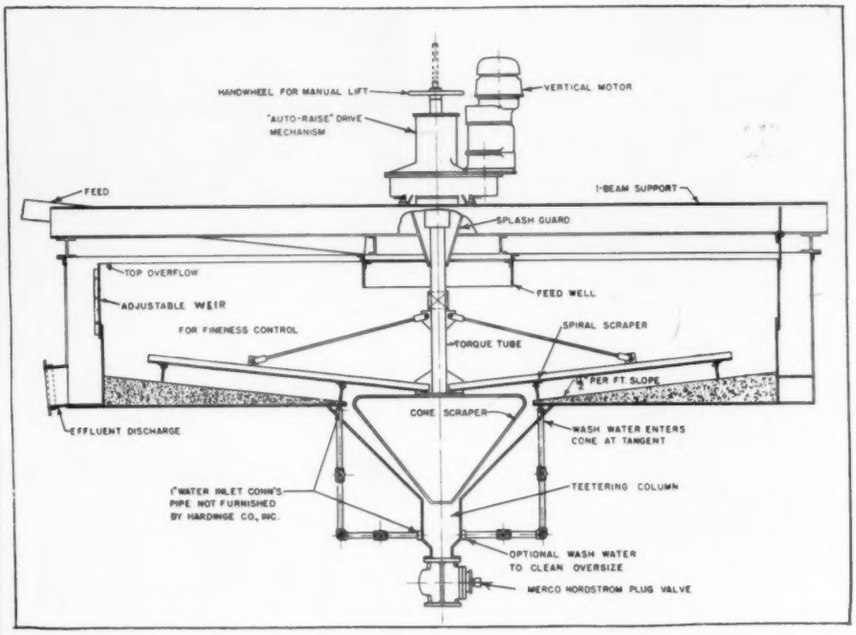
"When you need TRACTION you need THORNTON"

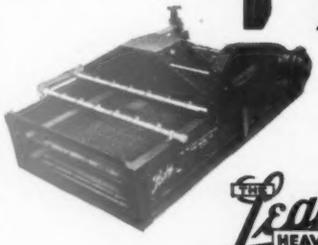
Tractor shovel loading a car.



Sectional elevation of the improved hydro-classifier.

TRI-VIBE

is Triple Defense against Blinding with only ½ H. P.



THE Leahy HEAVY DUTY VIBRATING SCREEN

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presents the most difficult of all grading problems, because it naturally invites "blinding" and slows down the production of ordinary screens.

But Tri-Vibe "triple-powers" the free-swinging screen Jacket over the entire area, keeping the meshes clear on the LEAHY Type "C" Vibrating Screen, and boosting capacity.

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The Original Deister Co.
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911 Glasgow Ave., Fort Wayne, Ind.

bility and traction. Quickly mounted bull-dozer blades and other special attachments are available to increase the usefulness of this machine.

• Hydro-classifier

The accompanying diagrammatic sketch shows the Hardinge hydro-classifier in which some noteworthy improvements have recently been made. Several installations of this machine have been made during the past year for classifying operations, particularly in sand-washing plants for washing sand free of included clay and micron sizes of sand.

The hydro-classifier consists of a circular steel tank divided into two compartments, a main or upper one equipped with an adjustable overflow weir in which agitating and collecting spiral rakes operate and a conical shaped lower one where a final wash is given the product being made.

The simple means now used allows the making of various sizes of products on one machine by varying the volume available for retention and at the same time the settling-out period in it. This is accomplished by using a telescopic-type peripheral weir, which allows varying the classifier depth from a maximum operating depth to one half of its maximum, or at any in-between point. A sand product may be made varying anywhere from practically all plus 80-mesh to practically all plus 240-mesh by this arrangement. Extremely fine material is removed as an overflow product.

Another interesting feature is the sand-cleaning chamber below the raking section where water enters tangentially, gives a swirling action to the sand, and removes the last traces of included fines or silt.

The machine is operated by a motor through an enclosed oil-lubricated drive gear and includes the Hardinge "auto-raise" feature to prevent damage from sudden overloads. Power requirements are small, a 1½-horsepower motor being sufficient to operate a 20-foot diameter classifier.

• Lubricants

The Gulf Oil Corporation has developed two new lines of lubricating greases for ball and roller bearings.

One, designated Gulf "anti-friction" grease, is recommended for heavy duty service. The other, Gulf "precision" grease, is recommended for lighter duty and higher speeds. Both have a high melting point and are specially prepared for greatest resistance to oxidation and separation.

• Air Cleaner

In order to show prospective users just what happens inside an Aridifier air cleaner and to prove that back-pressure is a negligible factor, the makers of this equipment are using a standard model of this device with a window set in the housing wall.

By this procedure, it is possible when one of these units is installed in an air line to see each rotor pick up speed as air is applied to the line. An arrow painted on the edge of each rotor indicates the direction of rotation and shows how each rotor quickly picks up speed.

When the rotors are at operating speed, it is a simple matter to see each rotor from the bottom up discharge drops of water and

PERFORATED METAL SCREENS
FOR SAND, GRAVEL STONE, ETC.

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Any size or style screen, in thickness of steel wanted with any size perforation desired.

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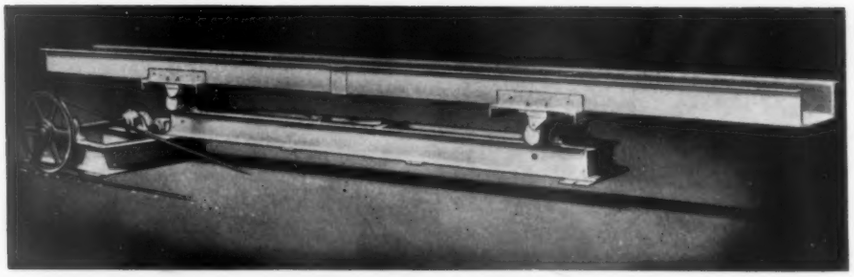
Air cleaner with window to show action while in operation.

oil and flecks of dirt as they are removed from the air stream and deposited in the dead air zone.

It is claimed that these units will remove all condensed moisture, oil and fine scale from air and gas lines and that even under 24-hour continuous operation no maintenance is required as rotors are balanced on grease-packed bearings. The manufacturer is the Logan Engineering Company, Chicago.

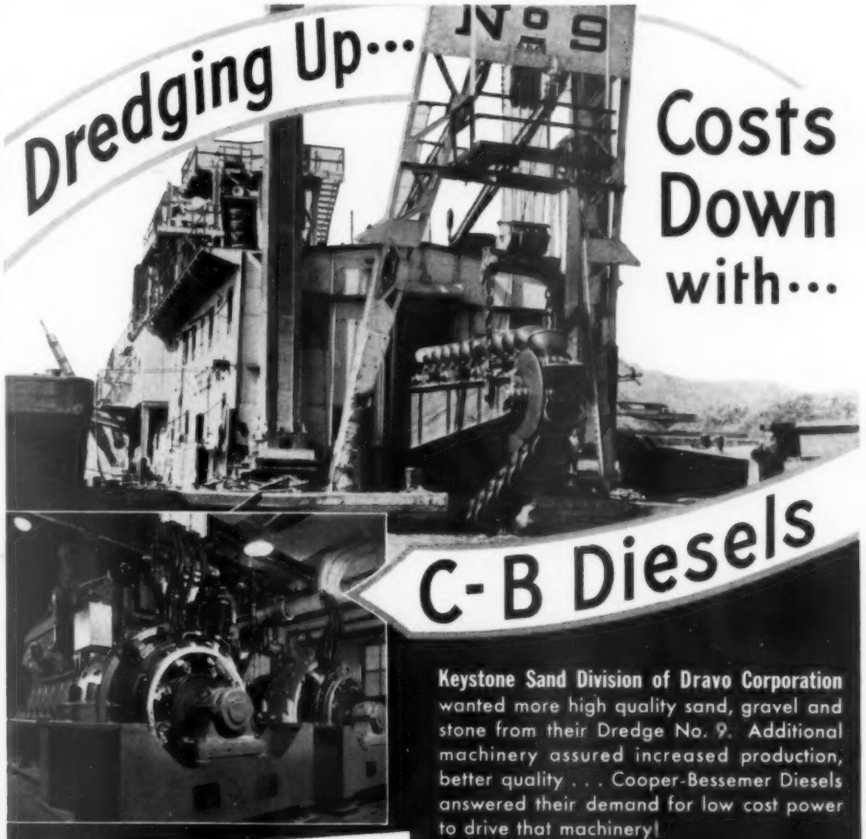
This Lima crane, owned by the United Concrete Pipe Company of Los Angeles, is shown equipped with a 140-foot boom for placing concrete on a tower which is part of a railroad relocation project near Redding, California. The one-cubic yard bucket and concrete weigh about 5,000 pounds.



Vibrating feeder-conveyor operating on the "lift-throw" principle.

• Conveyor

A new vibrating conveyor and feeder known as the Free-Flow has recently been introduced by the Standard Transmission Equipment Company of Los Angeles. It operates on the "lift-throw" principle with the motion of the trough becoming increasingly horizontal with



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Now, Dredge No. 9 turns out 400 to 500 tons of materials per hour . . . does it steadily with dependable Diesel-electric power . . . at less cost, thanks to economical Cooper-Bessemer engines. And, Keystone Sand likes the reserve power in those engines.

There's a C-B Diesel to meet and surpass your requirements for trouble-free, low-cost power units . . . 25 to 1280 hp.

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Company Name
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City State

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W. D. Taulman, 175 Spring Street, Atlanta, Georgia

the progress of each cycle, thus imparting to the conveyed material a gentle, forward motion. This motion is so designed as actually to suspend the mass in the air with only momentary contact with the trough on the upward period. This suspended float-action minimizes wear from abrasion, and the most fragile material can be conveyed without fear of breakage.

INCORPORATIONS

Henderson Concrete Company, Henderson, Kentucky, $40,000. Edward N. Frisse, J. H. Rudolph, W. R. Humber and others.

Dunn Limestone Company, Spencer, Indiana. 1,000 shares n.p.v. John D. Beem, Felix A. Dunn and Watson Boker.

Service Concrete Corporation, Muncie, Indiana. 1,000 shares n.p.v. Howard H. Hoffman, Frances M. Hoffman and Ralph E. Fullhart.

Square Deal Cement Block Company, Detroit. $50,000. James Manzo, 7705 Prairie Avenue.

Bryson Talc Company, Marion, North Carolina. 1,000 shares n.p.v. Charles V. McGann, A. S. Janeway and H. J. Bryson.

Ready Mix Concrete Company, Orange, Texas. $4,000. R. C. Doors, George Masterson and C. H. Steele.

Hanna Concrete Company, 4727 Lamon Avenue, Chicago. 500 shares n.p.v. D. K. Merwin, L. E. Souers and H. A. Herbruck.

Refractories, Inc., Toledo, Ohio. $50,000. Fred Witmer, Sr., E. H. Mauntler and Frank C. Eikemeyer.

Peerless Lime Products Company, 239 Fourth Avenue, Pittsburgh. $25,000. Bernard Perkoski, Laura Perkoski and U. G. Vogan.

Book Reviews

Geophysical Exploration, *by C. A. Heiland. Published by Prentice Hall, Inc., New York. 1,013 pages. Price $10.00.*

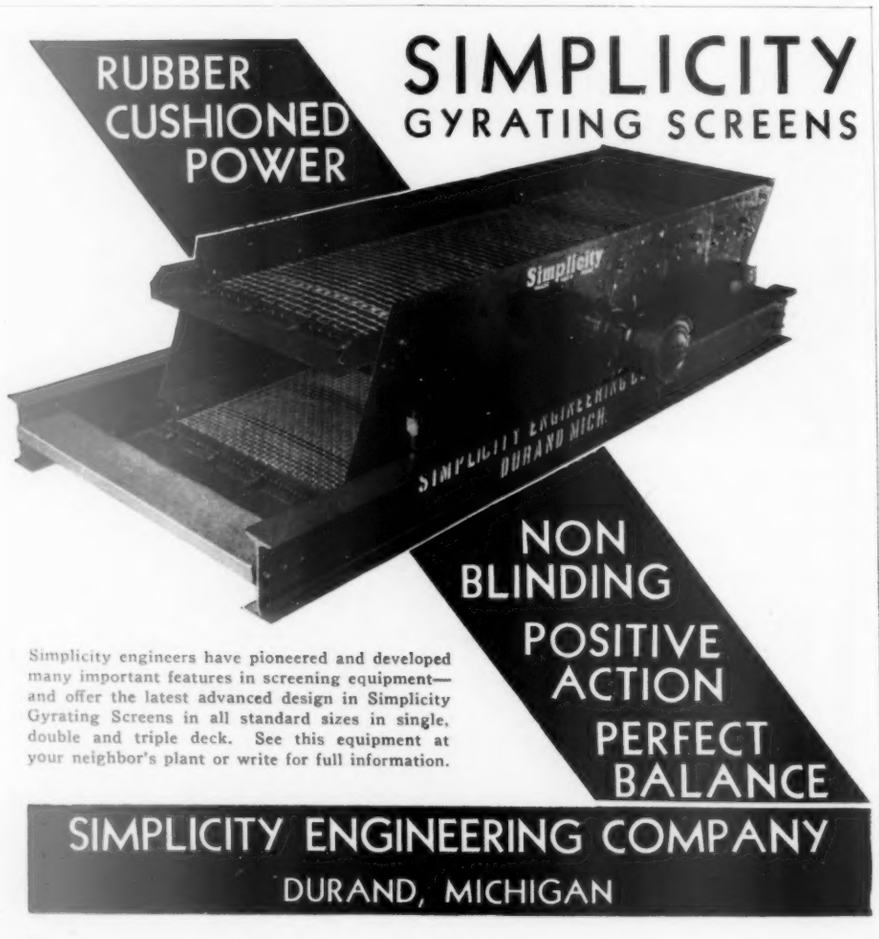
This book is intended as a comprehensive survey of the entire field of geophysical exploration. The author, who is professor of geophysics at the Colorado School of Mines, has endeavored to present the subject in broad perspective, emphasizing the relations, differences, common features, and, above all, the fundamentals of geophysical methods.

The material is divided into two parts of six chapters each. The first part, written in elementary language, addresses those desiring an insight into the working principles and geological applications of geophysical methods. It is intended for individuals in executive and geologic advisory capacity and for persons not directly concerned with field or laboratory operations.

The second and major portion is written for the technical student of geophysics. It presents the subject from an engineering point of view, striving at a balanced discussion of theory, field technique, laboratory procedure, and geological interpretations. The author has aimed at a presentation that will enable the geophysicist to get an insight into the geologist's reasoning in selecting geophysical methods and in interpreting geophysical data, and that will acquaint the geologist with the mathematical and physical approach to instrument and interpretation problems.

Union Policies and Industrial Management, *by Sumner H. Slichter. Published by the Brookings Institution, Washington, D. C. Price $3.50.*

During recent years, the efforts of some unions and some managements to study their common problems in a peaceful and constructive spirit has gone much beyond the mere settlement of specific disputes. It has attacked underlying causes and thus led to coöperation between management and the unions in removing these causes. General interest in the possibility of union-management coöperation has increased greatly, but its actual development still covers only a small percentage of industry. Even so, its constructive accomplishments have been many. A major question now is whether the dynamic policy of coöperating to help employers increase efficiency will be practiced by only a few unions or whether it will gradually spread until it becomes the policy of a large part of the labor movement. The system of industrial jurisprudence has not yet been perfected, and its improvement can be accomplished only by careful study of past experiments and current problems. These vital issues are set forth in much detail in this volume and hence it should be of particular value to industrial executives, business men, and all students of labor problems.



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Trade Literature

Barber-Greene Bituminous Mixer, (Bulletin 842), 12 pages. Barber-Greene Company, Aurora, Illinois.

Washing Equipment for Sand and Gravel, (Bulletin 41), 28 pages. Eagle Iron Works, Des Moines.

Engineering Progress—1940, 40 pages. Westinghouse Electric & Manufacturing Company, East Pittsburgh.

Magnetic Variable-Speed Drives, 12 pages. Electric Machinery Manufacturing Company, Minneapolis.

Maloney Pneumatic Boulder Buster, (folder). Mallar Pneumatic Tool Company, St. Louis.

Engine Driven Centrifugal Pumps, (Bulletin B6153), 4 pages; *Annual Review of Sales and Engineering Developments,* 100 pages. Allis-Chalmers Manufacturing Company, Milwaukee.

Electrically Controlled Poidometer, 4 pages. Schaffer Poidometer Company, Pittsburgh.

Slag for Defense Construction, 32 pages. National Slag Association, Washington, D. C.

Modernizing Your Diesel, 12 pages. Fairbanks, Morse & Company, Chicago.

Osgood Type 80 Air Control Excavators, (Bulletin 4102), 16 pages. Osgood Company, Marion, Ohio.

Lubriplate Lubricants, 16 pages. Fiske Brothers Refining Company, Newark, New Jersey.

Truck Mixer Charging Plants, (Bulletin B31), 16 pages. Heltzel Steel Form & Iron Company, Warren, Ohio.

Rees Dust Arrestors, (Bulletin 29), 4 pages. Rees Blowpipe Manufacturing Company, Los Angeles.

Eagle Truck-Mounted Loader, (Bulletin 241), 4 pages. Eagle Crusher Company, Galion, Ohio.

Hendrick Screens, 8 pages. Hendrick Manufacturing Company, Carbondale, Pennsylvania.

Ransome HHP Truck Mixers

6 Ransome EXCLUSIVE FEATURES

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The CONCRETE MANUFACTURER

May, 1941

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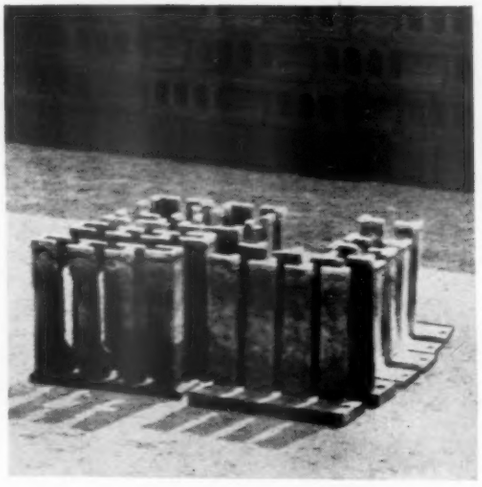
Making Tamper Feet Last Longer



The accompanying picture shows six sets of tamper feet used at a plant making cinder blocks. In the continuous operation at this plant, ordinary tamper shoes wore off on the corners in only a week of service, compared to a life of eight weeks for hard-faced shoes. It is now standard practice to hard-face the corners of each tamper shoe with Haynes Stellite No. 1 rod by the oxy-acetylene process.

After about every two months, the hard-faced shoes wear enough on the corners to justify their being touched up. The corners are then rebuilt with this same hard-facing alloy and are ready for another two months of service. This maintenance procedure has proved so economical that it has been in effect at this plant for the past two years. Only a small amount of hard-facing alloy is necessary for each rebuilding, and the tamper is thus kept at high operating efficiency at a very low cost.

MEMBER OF
NATIONAL
READY MIXED
NRMCA
CONCRETE
ASSOCIATION

Reproduced above is the attractive new decalcomania insignia just released by the National Ready Mixed Concrete Association for use of its members on truck-mixers, office windows and doors, etc. The actual emblem is 6 inches wide and 7 inches high and in three colors—red, yellow and black. All members are urged by Executive Secretary V. P. Ahearn to make liberal use of it. Member companies may obtain them in quantities for a few cents each. They are easy to apply, simple instructions appearing on the reverse side of each copy.

Reaffirm Joist Standard

The Division of Simplified Practice of the National Bureau of Standards has announced that Simplified Practice Recommendation R87-32, Forms for Concrete Joist Construction Floors, has been reaffirmed without change by the Standing Committee of the industries affected.

This recommendation, first promulgated in 1929, revised in 1932 and reaffirmed in 1936, covers the dimensions of standard and special forms for concrete-joist floors.

■

Establishes Indiana Plant

The Lock Joint Pipe Company of Ampere, New Jersey has established a temporary plant near North Vernon, Indiana to fulfill a contract with the War Department.

The contract involves the manufacture of concrete pipe for the Jefferson Proving Ground project at North Vernon.

Storage yard and plant of the South Hammond Coal & Material Company.

HOUSING PROJECTS SPELL OPPORTUNITY FOR BLOCK MAKERS, READY-MIX FIRMS

Truck-mixers at the site of the Columbia Center housing project.

CONCRETE is playing an important *rôle* in the numerous housing projects now in the process of construction in scores of our large and medium-sized cities. All these government-financed dwellings must be of fireproof construction, relatively inexpensive to build and maintain, and safe from the ravages of time, the elements, termites, rot, etc.

A typical example is Columbia Center, a low-rent housing project being erected by the Housing Authority of Hammond, Indiana, under a loan contract with the United States Housing Authority. Comfortable, sanitary housing will be provided at low cost for 400 families in 146 separate one- and two-story, 2-, 4- and 5-family residences. All the foundations are of concrete-masonry construction, the partition walls and back-up for the face-brick exteriors are of Haydite block, and the floors are reinforced-concrete slabs poured on the job. There isn't a stationary concrete mixer or an unsightly pile of aggregate on the job site, however, since all the concrete is of the ready-mixed variety. The general contractor, Lloyds Builders, Inc., of Chicago, sublet the preparation of the concrete to two firms—the Bieker Company of Hammond, and the Northern Indiana Lumber & Coal Company of Whiting, Indiana. Each has its own batching plant and deliveries are made by Blaw-Knox, Smith-Mobile and Ransome truck-mixers. These discharge their products into conventional two-wheel rubber-tired concrete buggies which are wheeled up portable wooden ramps alongside the buildings.

About 100,000 gravel and crushed-stone blocks were used in the foundations and basement walls and the equivalent of approximately 150,000

One of the truck-mixers loading a buggy at the foot of a ramp.

By HARRY F. UTLEY

standard 8-inch Haydite blocks are being used above ground. Most of these units were produced in the plant of the South Hammond Coal & Material Company, which is located only about 1½ miles from the construction site. This plant has been engaged in the manufacture of concrete products for many years. It is owned by William G. Fredericks and its operation is supervised by his son Edward Fredericks. It

was recently modernized by the construction of covered-storage facilities with a capacity of about 25,000 units and the installation of a Besser Vibrapac automatic block machine. This high-production machine makes three blocks at a time and easily turns out 500 per hour. The units are borne off by an air hoist supplied by a Curtis compressor. All the Haydite units are produced on the Vibrapac as well as most of the standard-weight blocks. The three units come from the machine

Part of the covered storage and some of the special racks.

on a single plain steel pallet 17 by 26 inches in size and are hoisted into special Besser-Lange steel racks built to receive a pallet of this size. These racks have no cross bars, welded angle-irons supporting the pallets and make loading and unloading a simple matter. Three older tampers, two Anchors and a Besser machine, are also employed for making standard-weight units and "specials." No sand or gravel is used, the aggregate being crushed stone which is trucked in from the near-by Thornton quarry of the Material Service Company of Chicago. One of the tampers is equipped with a Straublox attachment which trowels the sides of the block to produce a dense, watertight unit.

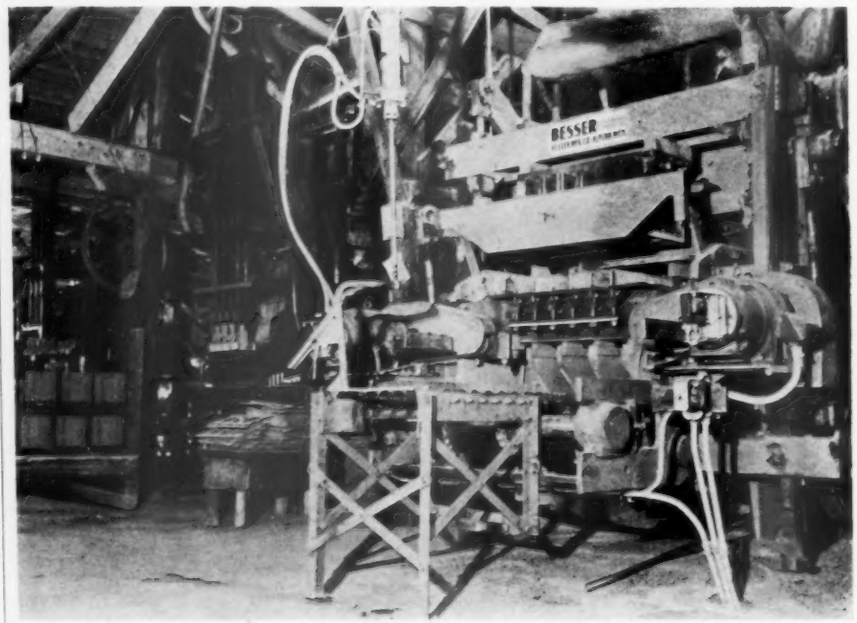
The storage-battery-operated lift-truck with a rack-load of 60 standard blocks.

Much labor and time is saved by transporting the racks into and out of the three steam kilns with an "Automatic" storage-battery-powered electric lift-truck. This unit is in constant service, its batteries being charged each night without attention by an automatic charger which shuts off when the batteries reach their full charge. Two Barrett hand-operated lift-trucks are used for "spotting" racks at the tampers.

Mr. Fredericks plans to enlarge his covered storage this summer so that by next winter as many as 100,000 blocks may be protected from the rain and snow. The plant and kilns are floored with concrete, with concrete runways extending into the yard. The company, in common with other products makers in the Calumet steel-producing district, has a coöperative arrangement with building-supply dealers regarding sales and also makes direct retail sales itself. Prices have thus been maintained on a firm level, currently ranging from 12 to 14 cents delivered, which allows a fair margin of profit for the operator and the dealer.

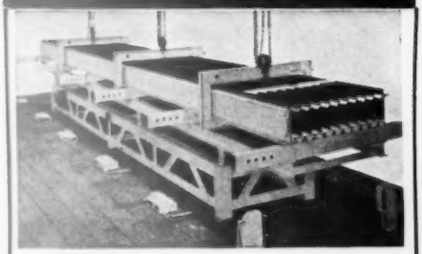
Buys Pipe Plant

The Marietta Concrete Corporation, Marietta, Ohio, maker of concrete-stave storage silos and bins, hundreds of which are used by operators in the pit-and-quarry field, has acquired the plant of the Lilesville (North Carolina) Pipe Company.



The vibrator block machine and, at left, two of the three tamp-type machines.

KIRK & BLUM



STEEL FORMS
for Concrete Joists

These forms are made in standard 20-ft. lengths. Also special lengths to meet individual requirements. The illustration above shows method of removing complete set of poured joists, which permits multiple production where desirable or feasible.

HEAVY DUTY VIBRATING TABLES can be furnished

We manufacture Sewer Forms—Curb and Gutter Forms—Steel Concrete Forms of all Kinds. Write for details—no obligation.

THE KIRK & BLUM MFG. CO.
2818 Spring Grove Avenue
Cincinnati • Ohio

Special Truck Transports Bulk Cement

THE steady growth of the ready-mixed-concrete industry is evident not only from the number of new producers entering this field but also from the growth of those already in it. Most established producers have grown with the industry in varying degrees depending a good deal upon the territories in which they are operating. An example of sound growth is the Plaza Sand & Stone Corporation of Yonkers, New York, a suburb of New York City on the Hudson River. This company entered the ready-mixed-concrete business in 1932 with a fleet of five

By W. E. TRAUFFER

4-cubic yard truck-mixers. Now eleven 4- to 5-cubic yard mixers are operated. Most of the demand is for residential construction. Considerable dry-batching of aggregates is also done for highway and bridge construction and all kinds of bulk aggregates are sold.

This business was founded in 1928 as the Yonkers Sand & Stone Corporation to deal in building materials. Later it was combined with several other companies as the County Sand & Stone Company. In 1933 this combination was dissolved and the present name was adopted.

The original plant for batching aggregates and cement into truck-mixers consists of a 3-compartment, 150-ton Blaw-Knox steel bin. A single aggregate-batcher, with a beam scale and indicator, is used. Originally cement was dumped from scales into a box from which it was then discharged into the truck-mixers. In 1935 a 300-barrel Blaw-Knox circular bulk-cement bin with a 12-barrel weighing batcher was erected next the aggregate bin. A special bulk-cement truck hauled the cement from the railroad yard ¼-mile away, where it was received in l.c.l. containers, and discharged it to a bucket elevator. This truck still does all the cement hauling. On each trip it is weighed both empty and loaded on city scales *en route* to check on the amount of cement received.

In 1938 also a square 300-barrel Blaw-Knox bin was added to the batching plant for the storage of a second type of cement. The same elevator now serves both bins. An inclined screw-conveyor feeds cement from this new bin into the batcher under the old bin. This screw-conveyor and the batcher discharge gate are push-button controlled.

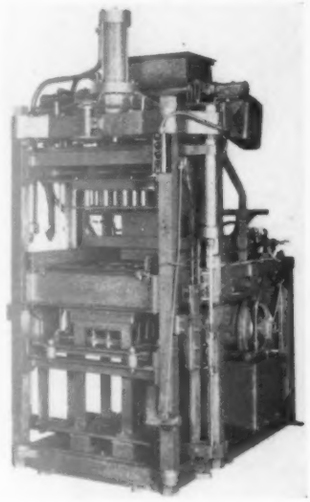
A general view of the main batching plant and one of the mixer trucks.

Another plant view showing some of the material-handling and storage equipment.

Truck-mixers are now loaded in two stops in a concrete-lined depression under the three bins. The required amount of aggregates is first loaded and the cement is added at the second stop. Water is added from a tank. In cold weather a boiler supplies steam to heating coils in the aggregate bin and the water tank.

Late in 1939 a separate 300-barrel Blaw-Knox bulk-cement bin with an elevator and a batcher was installed in this yard for state-inspected and other special cements. When concrete is ordered for state or special work the truck-mixers get their cement from this bin. In this yard also are four separate Blaw-Knox bins for loading dump

HYDRAULIC
VIBRA-PRESS



A High Production Machine Making Blocks Which Are Demanded by the Contractor, Endorsed by the Architect, Desired by the Mason.

KENT MACHINE CO.
Cuyahoga Falls, Ohio

ONE Machine
for
ALL Size Pipe

Cut your costs of concrete pipe production by using the same machine for all sizes from 6" to 60".

Universal "all purpose" concrete pipe machine produces quality pipe at lowest cost, because it requires smaller investment, insures greater footage per bag of cement, and more pipe per man.

Start the concrete pipe business with Universal equipment, and you will be sure of maximum profits.

Write for Bulletin

UNIVERSAL CONCRETE PIPE CO.
Columbus Ohio

The bulk-cement bin with car at left and special truck at right.

trucks with cinders, stone, sand and gravel.

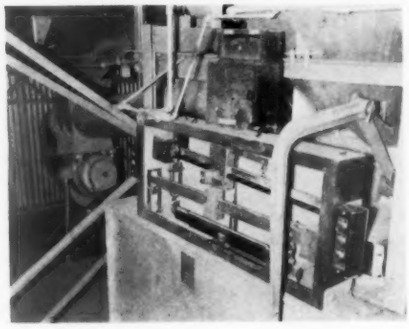
All the aggregates are received in barges on the Hudson River. Two Northwest cranes unload them and drop them into the various bins. One crane has a 50-foot boom and a ¾-cubic yard bucket. The other has a 60-foot boom and 1½-cubic yard bucket. The plant dock accommodates only one 600-cubic yard barge at a time and this can be unloaded in about 6 hours.

The larger trap-rock barges are unloaded at the city dock a short distance from the plant. The company also has bins there for the 4 sizes of trap rock which are always carried in stock.

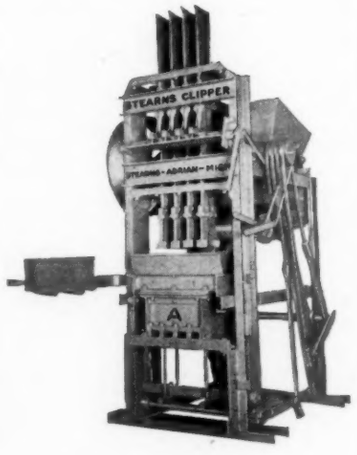
The company's delivery fleet now consists of 27 trucks, of which 11 are 4 to 5 cubic yard Chain Belt Rex mixers mounted on Mack trucks. Of these seven have been converted to Cummins Diesel engines; the other four have gasoline engines. All the other 16 trucks have dump bodies. Thirteen are Mack trucks with 12-, 10- and 8-cubic yard bodies. The three 12-cubic yard trucks also have Cummins 6-cylinder Diesel engines. There are two 10-cubic yard Autocar trucks and a Mack truck with a 3-cubic yard body which is used as a service truck.

The special cement truck has a steel end-dump body with high sides which make it possible to haul a 14-ton load. The cement is discharged at the plant by tilting the body so the cement will flow through a small gate and a chute into the hopper of the cement elevator. A hoe is sometimes used to keep the cement moving. In rainy weather the open top of the body is covered with a tarpaulin.

Special truck discharging bulk cement to boot of elevator.



Batchers and scales in the main plant. Cement-feed screw is at left.



The Clipper Stripper, shown above, available in 5 models, is only one of the popular machines in the ANCHOR Line of Complete Equipment for the Concrete Products Plant. ANCHOR Engineering Service in the design of new plants or revamping older operations is nationally famous. Consult us before you buy equipment or modernize your plant . . . it costs no more.

Hobbs block machines, Anchor tampers, Anchor, Jr. strippers, Stearns power strippers and Jolterete, Stearns mixers and pallets, Straublox oscillating attachments, etc. Repair parts for: Anchor, Ideal, Universal, Stearns, Blystone mixers and many others.

ANCHOR CONCRETE MACHINERY CO.
G. M. Friel, Manager Columbus, Ohio

LEFT—This view shows some of the concrete-block storage with office and putty plant at the left, gravel and block plants at right.

Adobe Yielding to Concrete as Building Material in Arizona

IN Phoenix, Arizona, as in many other southwestern cities, especially those near the Mexican border, adobe has long been the favored building material for houses and small buildings. More permanent and expensive building materials were only used in the larger business and municipal structures and in the highest-priced homes. In the last few years, however, concrete building units have gained a foothold and are being used in increasing quantities for all types of buildings. The individual efforts of local producers and the nation-wide advertising of the Portland Cement Assocation can divide the credit for this achievement.

The experience of the Union Rock & Material Company of Phoenix is in many ways typical. This company was formed in 1932 for the production of sand and gravel. In 1938 the growing possibilities for concrete masonry led the company to install a small Flam vibrating block machine. The results were so satisfactory that a larger Flam block machine was later added. These two machines together can produce 6,000 standard 4- by 8- by 12-inch concrete blocks in an 8-hour day.

Individual job mixers supply concrete for each machine and the blocks are made on wooden pallets. The blocks are loaded on carts which are of original design and carry four or more units at one time. The feature of this two-wheeled cart design is the leg which holds it upright while it is being loaded and which can be snapped up out of the way when the cart is to be moved. In the storage yard the blocks on their pallets are deposited by the carts on rows of 2- by 6-inch boards which are set edgeways and extend about 2 inches above ground level. These boards also provide ventilation under the piles of blocks to promote quicker and more uniform curing.

The blocks made in this plant are accepted for all types of work in and around Phoenix. The officials of the company have always felt that low- and medium-priced houses offered one of the largest outlets for its products. As a result hundreds of such houses have been built of concrete blocks. In a development, known as the North Encanto subdivision northwest of downtown Phoenix, 60 concrete-block houses were recently completed. Most of these have 5 or 6 rooms and they all have concrete floors. These houses sell for from $3,000 to $4,000 each including the lots and landscaping.

An outstanding structure built entirely of concrete blocks is the El Encanto Apartment building, which was completed late in 1939. This is a beautiful 2-story building erected at a cost of $100,000. It is built in the Spanish style in the form of a hollow square with a patio inside. The blocks are cement painted.

In 1938 the company built a lime-putty and ready-mixed-mortar plant with a capacity of 25 cubic yards in 8 hours. The putty is slaked in a horizontal blade-type mixer and is aged in three concrete-block-lined vats of 30 cubic yards capacity each. The cured putty is shoveled out of the vats to a platform and from there into a ½-cubic yard Blystone horizontal mixer. Sand is fed by an elevator into a bin over the mixer. In order to eliminate truck waiting time an old 2-cubic yard truck

The block plant with palleted units being cured in the foreground.

One of the off-bearing carts with prop in place for unloading.

This view shows one of the carts with prop raised while in transit.

body has been arranged so that the mixer discharges the finished mortar into it, whence it can be dropped into a truck on arrival. The same elevator is also used to feed dry plaster sand into a second bin from which it is loaded into trucks.

The Salt River bed near the plant is the source of the sand and gravel. Crawler drag-lines load these materials into trucks during the greater part of the year when the river is dry. In wet weather a slackline-cableway excavator loads cars hauled by an old truck converted into a locomotive. The trucks or cars discharge the material into a hopper, and a conveyor passes it over a grizzly into a 10- by 20-inch Allis-Chalmers jaw crusher. A bucket-elevator feeds it to a revolving screen from which the oversize goes to an Austin No. 2 gyratory crusher in closed circuit. The gravel goes from the screen into bins and the sand to a drag-washer and then into bins. The bins are over a concrete truck-loading tunnel and are open on one side so that the excess of any size overflows to ground stock-piles. The dead-stored material is reclaimed by a crawler crane.

There is also a dry plant for the production of fine sizes of gravel. This is used in the concrete blocks and is also sold to a local concrete-pipe manufacturer. Minus 1-inch gravel is discharged on a conveyor feeding a Colorado Iron Works roll-crusher. The minus ⅜-inch product is fed by an elevator into a separate bin over the truck-loading tunnel. The combined plants produce about 200 cubic yards of finished sand and gravel in 8 hours.

The power for the aggregate plants is supplied by a 75-horsepower, 2-cylinder Fairbanks-Morse Type Y Diesel engine. All the equipment is driven by means of belts and line-shafts. This engine operates both plants at capacity for 8 hours on 20 gallons of 6-cent fuel oil.

A striking view in the patio of a concrete-masonry structure—the El Encanto apartments.

One of the vibrating block machines used in the plant.

Cement Company Upheld

A motion filed by the Western Public Service Company to dismiss a case in which the Monolith Portland Midwest Company of Laramie, Wyoming, seeks a $286,400 judgment, has been denied by Federal Judge T. Blake Kennedy at Cheyenne. The judge upheld, however, the defendant's motion demanding a bill of particulars to make more definite and certain.

The suit was originally filed in district court at Laramie and grew out of the cement company's claim that failure of power service on the part of the defendant company had resulted in financial loss to itself.

To Furnish Concrete

A contract to furnish 13,414 cubic yards of plant-mixed concrete has been awarded the Shaw Coal & Material Company of Kansas City, Missouri by the city of Kansas City.

The material, to be used in street construction, will cost the city $7.20 a cubic yard.

$10,000 Fire Loss

Fire destroyed the plant of the Acker Cement Products Company at Fort Wayne, Indiana on April 2 with a loss estimated at $10,000.

The biggest single loss in the blaze was the company's Joltcrete block machine, installed about a year ago.

A Correction

An article in the April issue on the operations of the Iowa Concrete Crib & Silo Company of Des Moines stated that the price of 8- by 8- by 16-inch concrete block at the plant is 8 cents. Harve Kilmer, general manager, points out that 12 cents is the prevailing price. Mr. Kilmer also reports that the silo-and-crib end of the business is now $60,000 annually instead of $40,000.

Koenig Plant Destroyed

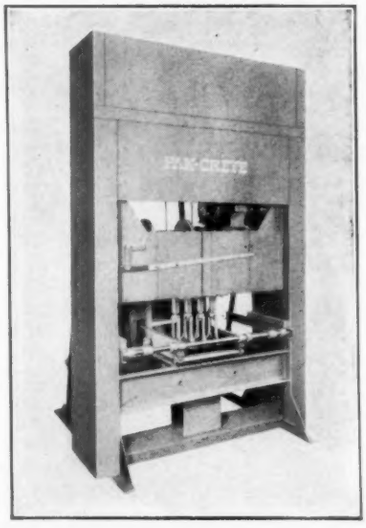
Fire caused $10,000 damage when it practically destroyed the concrete-products plant of the William F. Koenig Company at Cincinnati recently.

● Floor and Roof Slabs

Equipment for the production of Leesch System precast concrete floor and roof slabs is expected to be available on a license basis shortly, according to an announcement from Ralph C. Condo, trading as James Condo & Son, Somerville, New Jersey, inventor of the process.

Mr. Condo described the system at the recent concrete convention in Chicago (P&Q, March, 1941, page 87). The units are a combination of joist and slab and are T-shaped in cross sections.

A LOT OF MACHINE FOR A LITTLE MONEY



VIBRATION AND PACKING WITH

PAK-CRETE

BETTER BLOCKS AT LESS COST
PRECISION MADE—QUICK DELIVERY

KRAMER CORPORATION
LEHMANN BLDG. PEORIA, ILL.

FOR SALE

An exceptional opportunity to purchase a complete Concrete Block plant, in a middle-western city where the demand and sale of concrete blocks has been exceptionally good. The plant includes one Anchor 16-inch machine, mixer, 6000 pallets, conveyors, 3 motor electric pumps, 5 kilns, drag, building and 6½ acres of land. Owner wishes to retire. If you are interested communicate with

MODEL CEMENT STONE COMPANY
2224 East 36th St., Minneapolis, Minn.

FACTS ABOUT THE MOST MODERN TRUCK MIXERS IN THE INDUSTRY!

THESE EXCLUSIVE FEATURES GUARANTEE

that you'll get a new idea of truck mixer performance and usefulness when you buy Rex Hi-Discharge Moto-Mixers!

(1) **EXCLUSIVE HI-LO MIXING ACTION!** The only true end-to-end mixing action . . . means over 50% faster mixing . . . self-cleaning drum . . . takes a full batch without time-wasting "rocking."

(2) **BATCH IS VISIBLE AT ALL TIMES!** No door to open—you get full visibility of *every part of the batch.* No other truck mixer allows this quick and easy inspection!

(3) **"QUICK-AS-A-FLASH" END-CHARGING!** No charging door to put on or take off! Saves as much as 25 minutes per day per truck!

(4) **UNRESTRICTED DISCHARGE!** Big, roomy discharge opening that allows even the lowest slump mixes to rush out in a hurry! The fastest discharge of *any* truck mixer!

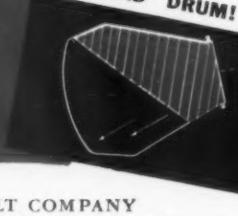
(5) **REX QUINT-SPOUT!** Five convenient chuting lengths in one discharge spout!

(6) **REX CHAIN BELT DRIVE!** With Rex parallel transmission—the strongest, most durable power transmission on any truck mixer!

REX A "LIVE" DRUM

Contrast the continuous Hi-to-Lo end Rex mixing action above to the "dead end" mixing action of the ordinary "high-discharge" drum below.

NOT A "DEAD" DRUM!



LOOK TO REX FOR LEADERSHIP!

Yes, it's a *fact* that these new Rex Hi-Discharge Moto-Mixers will cut your charging time as much as *five minutes per batch!* It's a *fact* that they have the *only true end-to-end mixing action*—that they are the only "proved-in-the-field" truck mixers to meet *all* of the requirements of high discharge service!

If you want to make today's highly competitive concrete jobs more profitable, see your Rex distributor or send the coupon for the "manual-catalog," "The Industry's Most Modern Truck Mixers." It's hot off the press and waiting for you.

Send for this "manual-catalog" today!

50th ANNIVERSARY
1891 REX 1941
CHAIN BELT COMPANY

Hi-Discharge MOTO-MIXERS

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CHAIN BELT COMPANY
1646 W. Bruce St., Milwaukee, Wisconsin

Please send me my copy of Bulletin 399 and tell me the name of the nearest Rex distributor.

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OUTSELL ALL OTHER

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CHECK LIST

EXCLUSIVE FEATURES THAT EXPLAIN JAEGER'S EVER GROWING LEADERSHIP

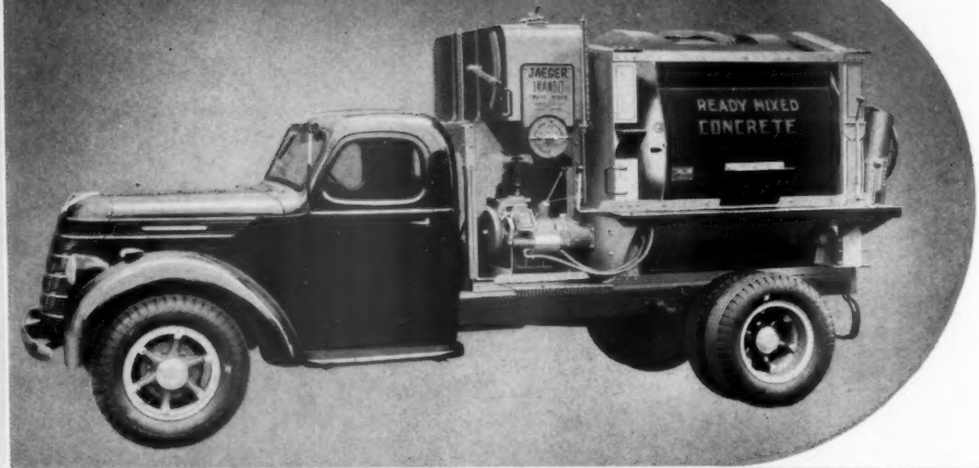
(A) ON BOTH "LOW-CHARGE" AND "HIGH DUMP" UNITS

1. "DUAL-MIX" END-TO-END MIXING WITH THROW-BACK REVERSING BLADES, producing higher strength, more workable concrete.
2. FASTER MIXING AND DISCHARGE of either high or low slump material.
3. QUICK ACTING CHARGING AND INSPECTION DOOR—Can take full batch in one drop through the top.
4. DUAL REVOLVING WATER SPRAYS —100% faster, spray uniformly from end to end of drum.
5. SYPHO-METER WATER TANK, accurate within ½% of tank capacity.
6. "UNI-VALVE" CONTROL of mix, tempering and flush water.
7. "WINTER SAFETY" WATER BOOSTER.
8. TWO-SPEED SHOCK-PROOF TRANSMISSION for long or short hauls or agitation.
9. VACUUM CAB-CONTROLLED TRUCK ENGINE DRIVE or SEPARATE ENGINE DRIVE.
10. COMPACTNESS—2 Yd. size can be mounted on Ford-type trucks.
11. COR-TEN STEEL (both corrosion and rust resisting) and highest type Automotive Construction throughout, insuring lowest maintenance costs.

(B) ON "HIGH DUMP" UNITS ONLY

1. "SURE-SEAL" models to meet rigid specifications, with
2. AIR-TIGHT VACUUM-CONTROLLED DISCHARGE DOOR
3. "DUAL-LOADERS" equipped for both top and end loading to meet different conditions, with
4. LEAK-PROOF CHARGING-DISCHARGING HOPPER

3 Yd. Standard "LOW CHARGE" Model



2 Yd. "SURE-SEAL" HIGH DUMP Model on Ford-Type Truck

JAEGER PORTABLE HOPPER

Keeps Your Truck Mixers Moving— Means 25% More Payloads per Day on Average Job

Tows to job with the first truck mixer load, takes 2 or 3 yd. batches at a time, permits mixers to return immediately. One hopper serves a big job. A few keep average fleet busy. Get our low price.

MORE CONCRETE IS SOLD BY JAEGER TRUCK MIXERS

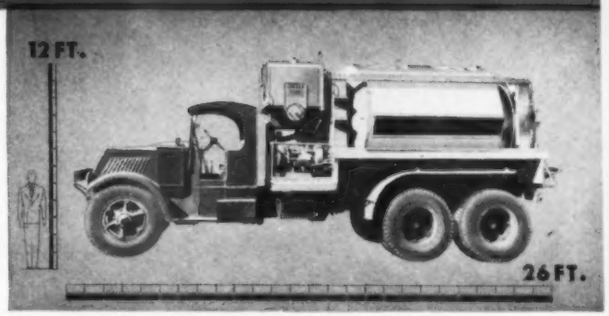
Truck Mixers, Agitators MAKES COMBINED!

Since Jaeger Pioneered the MODERN Truck Mixer, ANSWER TO TODAY'S READY-MIX DEMANDS

Standard LOW CHARGE TRUCK MIXERS, AGITATORS in 2 to 8 Yd. Sizes

Offered in 6 improved models—lowest to load (thus saving on bin equipment), fastest to mix and discharge any slump concrete, and equipped with larger "Dual-Mix" drums which take the payload capacity of modern trucks. In addition, many exclusive Jaeger operating features shorten the payload trip, increase the number of daily payloads, achieve maximum daily production of higher strength concrete.

Buy wisely—see "Check List" at left—it shows why these units are the overwhelming choice of operators who do steady, big volume business.



JAEGER BUILDS WORLD'S BIGGEST TRUCK MIXER FLEET FOR NEW YORK CITY OPERATORS:

Over 160 Units, in Sizes Up to 8 Cu. Yds., equipped with Jaeger Truck Engine Drive, Vacuum Controlled from Cab, Unanimously Chosen by Nine New York Operators to Modernize Their Plants. Jaegers were Selected after Comparison with All Makes. Steady Repeat Orders Have Followed Original Purchase.

HIGH DUMP TRUCK MIXERS, AGITATORS

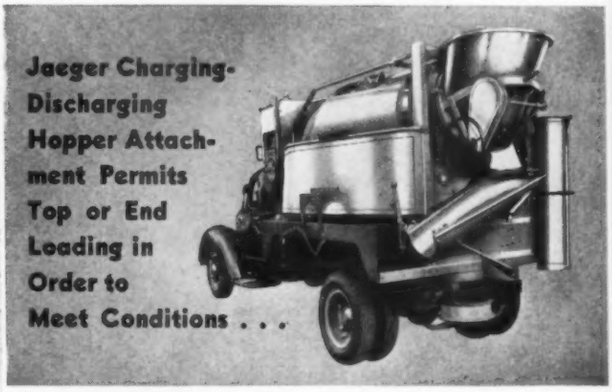
2 to 5 Yd. Sizes, Offered in Two Types to Meet Every Condition

(A) "SURE-SEAL" MODELS with Top-Loading and Inspection Door and Vacuum-Controlled Discharge Door, Giving Air-Tight Drum.

(B) "DUAL-LOADING" MODELS Equipped with Both End Loading Hopper and Top-Loading and Inspection Door.

Only Jaeger offers you truck mixers that combine high discharge with the ability to meet every specification and demand. Have all the proven features that have made Jaeger the acknowledged leader—bigger sizes of Dual-Mix Drums with Throw-Back Reversing Blades insuring higher strength concrete—fastest of their type to mix and discharge low slump material—Two-Speeds for long or short hauls or agitation—Shock-Proof Transmission with Vacuum Cab-Controlled Truck Engine Drive or Separate Engine — "Winter-Safety" Water Booster and Dual Revolving Sprays—Compactness to mount on Ford-type trucks.

Buy wisely—see "Check List"—it shows why Jaeger HIGH DUMP is outselling all other high discharge types.



Only end-loader that does not constrict drum opening and slow up charging and discharge. One quick turn of hand wheel opens or closes Discharge Gate — nc need to move entire Hopper (requiring many turns of a wheel) — no second seal to leak or wear.

Furthermore, where specified, these "Dual Loaders" may be top-loaded like any other Jaeger. This combination of top or end loading to meet conditions is patented and exclusive.

JAEGER AUTO-PAVERS WITH JAEGER SCREW SPREADER

The mobile paving plant of today — easily equals 34E Paver output with substantial reduction of costs and improvement in slab. Used in numerous States, growing in popularity. Get Catalog TMP-41.

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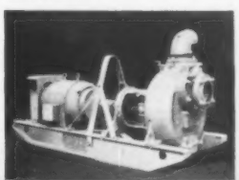

MIXERS TO 56S SIZE

Most complete and largest selling line in world.

"TOUCH CONTROL" HOISTS to 100 H. P.

Most advanced design, finger-tip control.

"EASY DUMP" CARTS to 11 CU. FT.

Save Truck Mixers waiting on jobs. Ask for prices.

GET THESE 1941 FACTS FOR READY-MIX PRODUCERS—MAIL TODAY!

New Data, Specifications, Prices, Terms—Just Off the Press. Check Information Wanted and Mail Slip

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602 Dublin Avenue, Columbus, Ohio

Send us complete 1941 plant data covering: ☐ Standard LOW-CHARGE Truck Mixers, Agitators, ☐ HIGH DUMP Truck Mixers, Agitators, ☐ Portable Hoppers, ☐ Auto Pavers and Spreaders, ☐ Pumps, ☐ Mixers, ☐ Hoists, ☐ Carts.

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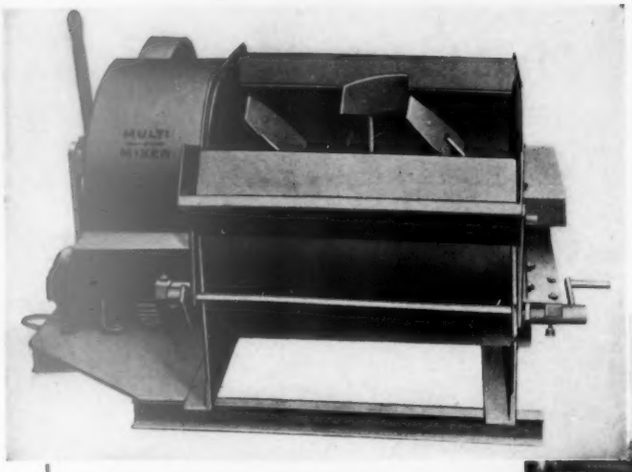
MULTIPLEX
MULTI-MIXER



Many concrete-products operators, like the Cecil Cement Block Company of Detroit, have solved the problem of producing quality concrete block at the lowest possible cost the Multiplex way. Two MULTIPLEX standard power tampers served by a Multi-Mixer have ended production worries for this operator for a long time. You, too, can benefit by using time-tested MULTIPLEX equipment in your plant. Write for catalog.

This "ace" of mixers comes in six sizes with your choice of drive and discharge arrangement. Reverse paddle action . . . less liner wear.

The *Multiplex* CONCRETE MACHINERY CO., ELMORE, OHIO

Miles CONCRETE EQUIPMENT

SIMPLE AS A-B-C

Miles Equipment does not require the services of an expert mechanic. Anyone without previous mechanical experience can keep a Miles machine in perfect operating condition.

Write for Catalog

The Miles Manufacturing Company

Dept. 2, Jackson, Michigan

LOOKING FOR USED EQUIPMENT?

Refer to the listings in the Broadcast Section in this issue for a wide variety of used and surplus machinery and supplies.

SPEED UP DEFENSE BUILDING with this MACHINE

Make your own masonry materials WHEN AND WHERE YOU WANT THEM and deliver direct to job. You use local raw materials and common labor.

Automatic flexible production assures lowest cost. Multiple size units offer structural improvements and short-cuts in construction time.

Present DUNBRIK Manufacturers are now making this material in wide range of sizes and colors and directly supplying defense work as well as private building.

Help speed up defense construction and at the same time develop a paying business. Investigate this opportunity for your territory. Write today for free book. It tells the complete story.

W. E. DUNN MFG. CO.

420 W. 24th ST. HOLLAND, MICH.

Filler Block in place for 4' length. Remove filler block for 3' length.

SHERMAN'S

Latest combination concrete pipe machine. Range in sizes 4" through 36" in 3' or 4' length. This machine has made owners money wherever used. It produces more for less.

Write for Prices and Information

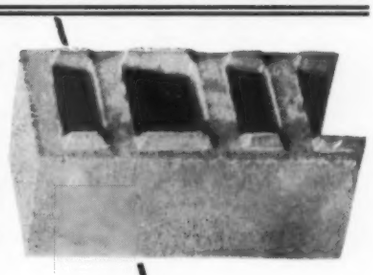
SHERMAN CONCRETE PIPE CO.
KNOXVILLE, TENN.

CONCRETE FLOORS . . . YOUR BIG UNDEVELOPED MARKET

This subject was the highlight of the recent Chicago concrete convention. The new, exclusive STONEX process provides the solution. It enables products makers to fill the need, at low cost, for a finished concrete floor. Learn more about the STONEX process and the licensing plan with protected territories. Write for complete details.

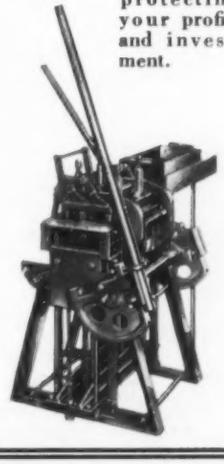
STONEX INDUSTRIES
500 N. W. 79th St. Miami, Fla.

Without Equal for Speed and Economy



Don't tie up your money in a high-priced concrete block machine. This improved double-press machine produces high-strength, high-quality units equal to any produced anywhere. Powerful pressure achieved by hand-operated levers. Patented, interlocking feature insures perfect block alignment, permits their being laid up without mortar by unskilled labor. Get the facts at once!

Exclusive, protected territories assigned to responsible operators; protecting your profits and investment.



MORTARLESS TILE MACHINE CO., Inc.
3328 San Fernando Rd.
Los Angeles, Cal.

Modernize with

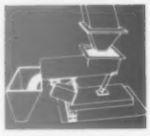
SYNTRON

Material Handling Equipment

"Pulsating Magnet"

ELECTRIC VIBRATORS

FOR CONSTIPATED BINS, HOPPERS AND CHUTES
Large and Small Models—Adjustable Power.
All Built for Continuous 24 Hour Duty.



"Vibra-Flow"

FEEDERS and CONVEYORS

Capacities from POUNDS TO 200 TONS Per Hour. With Finger Tip Rheostat Control of Rate of Flow of Bulk Materials.

"Vibra-Flow"

FEEDER MACHINES

FOR DRY CHEMICAL REAGENTS, ETC.
With Vibrated Supply Hoppers and Rheostat Controlled "Vibra-Flow" Feeders.

"Weigh-Flow"

GRAVIMETRIC FEEDERS

For ACCURATE FEEDING BY WEIGHT. "Vibra-Flow" Feeder Keeps Constant Load on Scale Suspended, Constant Speed Belt.

"Net Batch"

WEIGHING MACHINES

Extremely Accurate NET BATCH WEIGHING EQUIPMENT. Scale Mounted, Dumping Hopper Controls "Vibra-Flow" Feeder.

"Pulsating Magnet"

VIBRATORY PACKERS

SETTLE AND COMPACT MATERIAL IN BARRELS, DRUMS, CARTONS, CANS, BAGS, JARS, ETC.
Large and Small Models—Adjustable Power.

WRITE FOR NEW CATALOGUE

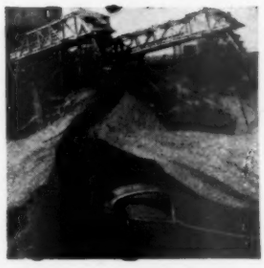
SYNTRON COMPANY

385 CARSON ST., HOMER CITY, PA.

DIG, HAUL & DUMP

. . . at lowest cost

Whether your problem is to dig gravel or to convey rock from quarry to crusher, or to stockpile and reclaim your surplus products—there is a size and type of Sauerman Cableway or Sauerman Scraper to meet your needs most economically. Put your problem up to us and we will save you money.



The single Sauerman Drag Scraper shown above handles the open storage of over 150,000 tons of surplus screened materials per year at large gravel plant.

Write for Catalog

SAUERMAN BROS., INC.

434 S. Clinton St., Chicago

SAUERMAN LONG RANGE MACHINES

QUINN PIPE FORMS

HAND or WET PROCESS

Make concrete pipe on the job with Quinn Pipe Forms. They can be handled by less experienced labor and produce uniform concrete pipe of highest quality. Quinn Pipe Forms make pipe conforming to A. S. T. M. requirements as to wall thickness and other standards.

Quinn Heavy Duty Pipe Forms are built to give more years of service — sizes for any diameter pipe from 12 to 84 inches — tongue and groove or bell end pipe — any length. Backed by over 30 years of service in the hands of contractors, municipal departments and pipe manufacturers.

HEAVY DUTY PIPE FORMS

Our Heavy Duty type with Adjustable Locks is shown above. Quinn Heavy Duty Forms are also available with a new wedge-type lock.

MEDIUM DUTY PIPE FORMS

Meet the demand for low cost equipment that produces a uniform quality of pipe in smaller amounts. For making pipe 12 to 60 inches in diameter —any length.

WRITE TODAY

Get complete information on prices and Special Construction Features of Quinn Pipe Forms. Give us size of job for estimate on your pipe form needs. Also manufacturers of Quinn Concrete Pipe Machines for making pipe by machine process.

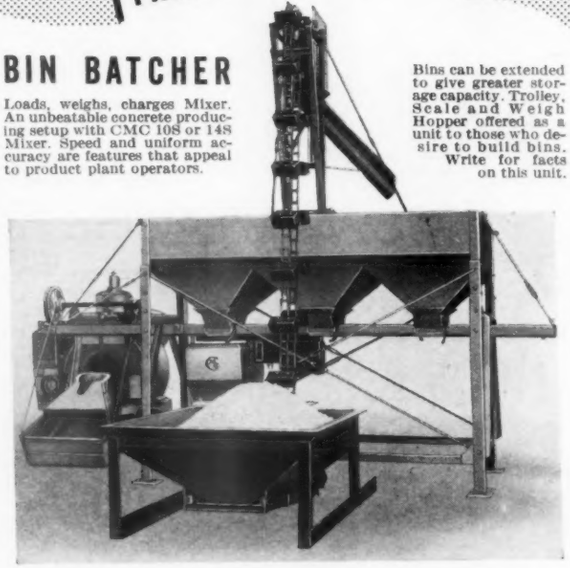
QUINN WIRE & IRON WORKS 1627 17th ST. BOONE, IA.

CUTS COSTS IN PRODUCING CONCRETE!

BIN BATCHER

Loads, weighs, charges Mixer. An unbeatable concrete producing setup with CMC 108 or 148 Mixer. Speed and uniform accuracy are features that appeal to product plant operators.

Bins can be extended to give greater storage capacity. Trolley, Scale and Weigh Hopper offered as a unit to those who desire to build bins. Write for facts on this unit.

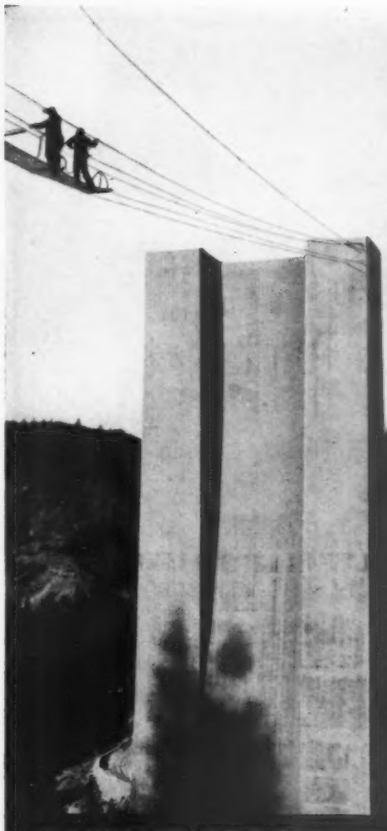


GET CMC'S NEW BIG EQUIPMENT CATALOG! See the newest in Concrete Mixers . . . all sizes. Also Hoe-type Mixers including No. 6 Wonder . . . a new outfit with belt pulley for brick, tile, block and general product plants. See the latest in Hoists, Pumps, Power Saws, Carts.

CONSTRUCTION MACHINERY COMPANY

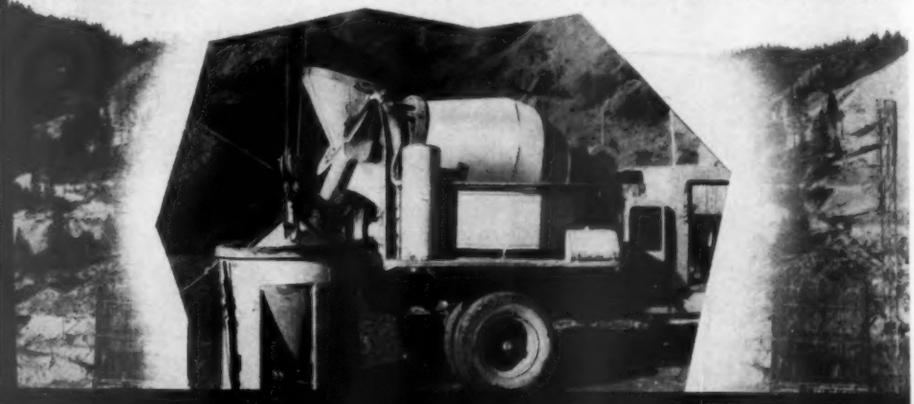
WATERLOO, IOWA

HIGHEST...*in the World!*



HIGH DISCHARGE and VISIBLE MIXING are two of the many Smith-Mobile exclusive features that caused this modern truck-mixer to be selected for Shasta Dam's railroad relocation bridge — *the highest double-decked span in the world!* • Smith-Mobile's HIGH DISCHARGE made it possible for the concrete to be discharged directly into 2 cu. yd. buckets without using hoist or ramp • And VISIBLE MIXING provided perfect control of the concrete, as it permitted the engineers to check the batch during the mixing operation • Because of their superior design and performance, Smith-Mobiles are TOPS on these big construction jobs • Available in all standard sizes • Write for catalog 198-A.

THE T. L. SMITH Company • 2887 North 32nd Street • Milwaukee, Wisconsin



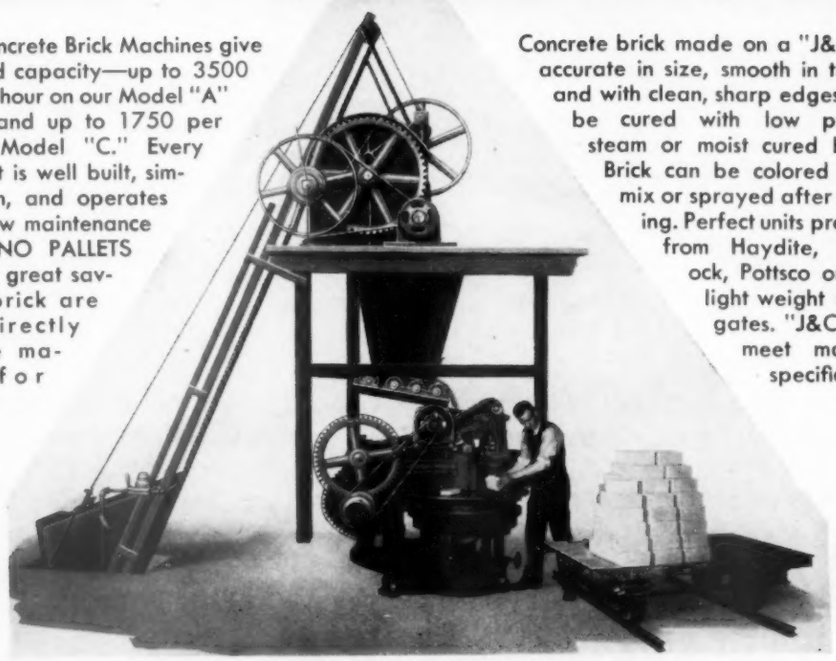
SMITH-MOBILE • THE *Modern* TRUCK MIXER and AGITATOR

A 3222 4H

PRODUCTION UNIFORMITY

"J&C" Concrete Brick Machines give you record capacity—up to 3500 bricks per hour on our Model "A" machine, and up to 1750 per hour on Model "C." Every "J&C" unit is well built, simple to run, and operates on very low maintenance charges. NO PALLETS used — a great saving, as brick are taken directly from the machine for stacking.

Concrete brick made on a "J&C" are accurate in size, smooth in texture, and with clean, sharp edges. May be cured with low pressure steam or moist cured by air. Brick can be colored in the mix or sprayed after moulding. Perfect units produced from Haydite, Superock, Pottsco or other light weight aggregates. "J&C" brick meet maximum specifications.



Write for Profit Data

Since 1881

Model "C" Brick Machine, skip and car

JACKSON & CHURCH CO.

SAGINAW, MICH.

The CONCRETE MANUFACTURER

"One reason for the excellence of our product is our use of cored pallets, permitting the free circulation of curing atmosphere through the block."

Faber Cement Block Co. Inc.

One of Twenty plants that have installed their second Stearns Joltcretes!

Gerhardt Faber watching operations at the modern Ridgewood plant

Faber Cement Block Company, Inc., Ridgewood, New Jersey, makes both gravel and cinder blocks. Theirs is one of the outstanding plants in the East. Their experience with one Joltcrete led to the purchase of a second. An important consideration in the selection of Stearns machines was Faber's definite preference for cored pallets. (Write for circular regarding "The Advantages of Cored Pallets.")

Of all the vibrated blocks, only Joltcrete units are backed by years of experience, by more than 125 prominent installations, and by the famous Wisconsin Tests.

Only Stearns makes Joltcrete machines. This principle of limited amplitude vibration —vibration under pressure—is protected by broad basic patents.

Write for Stearns Joltcrete Folder

Makers and users of infringing machines will be prosecuted

STEARNS MANUFACTURING CO. - ADRIAN, MICH.

When you buy a block machine, Buy a Machine of Proven Worth!

Wherever you see this trade-mark, it means the finest equipment that modern engineering can build, or that money can buy.

Shovels
Draglines
Dragshovels
Crawler Cranes
Clamshells
Skimmers
Transport Wheels
Multibucket Excavators
Tower Excavators
Car Transformers
Tunnel Shovels
Dragline Buckets
Rock Grab
Pile Drivers
Water Well Drills
Blast Hole Drills
Oil Field Spudders
Prospecting Drills
4-Wheel Scrapers
2-Wheel Scrapers
Bulldozers
Bullgraders
Rippers
Sheepsfoot Rollers
Grubbers
Tractor Cabs
Snow Plows
Power Control Units
Dipper Dredges
Placer Dredges
Hydraulic Dredges
Clamshell Dredges
Railroad Cranes
Walking Draglines
Bit Dressers
Drilling Tools

Bucyrus-Erie
SOUTH MILWAUKEE, WISCONSIN
V12OA

In Cleveland

THE HOLLENDEN

In Cleveland's business center. 1050 rooms with bath and radio. 300-car garage in same building. Famous Vogue Room, popular-priced Coffee Shop.

In Columbus

THE NEIL HOUSE

Across from the State Capitol. 655 rooms, all with bath. New Century Room features dancing and entertainment.

In Akron

THE MAYFLOWER

One of the midwest's newest, finest hotels. In the center of downtown Akron. 450 rooms with bath and 4-station radio.

In Lancaster, O.

HOTEL LANCASTER

Ohio's newest hotel, completed Spring, 1940. 100 rooms with combination tub, shower bath.

In Corning, N.Y.

BARON STEUBEN HOTEL

Finest hotel in Corning. 100 rooms with bath at moderate rates. Garage in connection.

Check In

AT

DeWITT OPERATED HOTELS

The Hotels That Check With Every Travel Standard!

People who travel a lot set up a rigid code of the things they expect and demand in a good hotel. Because De Witt Hotels maintain such strict standards of excellence, they have long been favored by exacting travelers.

1. Rooms are large, cheerful and spotlessly clean. Beds are sleep-inviting.
2. Rates are surprisingly low for the service rendered.
3. There are restaurants to suit every mood ... good food at a price to suit every purse. Dance music and entertainment.
4. Employees are friendly, diligently trained, always alert to serve you.

DeWITT OPERATED HOTELS

THEODORE DeWITT, President • R. F. MARSH, Vice-President

Why Not Load the Cheapest Way?

In loading trucks the cheapest way is the best way.

Let your costs be your guide!

Barber-Greene Bucket Loaders have been checked against every other method of loading trucks. They have never failed to show substantial savings. They invariably use less power, require less skill. They save truck time, man time, job time. Their versatility makes them useful the year 'round for all types of loading, stripping, light excavating, and unloading cars. They are available with gravity, shaker or high capacity vibrating screens.

The mechanical design and exclusive features of the Barber-Greene place it way ahead in quality, dependability, and ease of operation.

Write now for full information. There is no obligation.

Barber-Greene Company
Aurora, Illinois

• STANDARDIZED MATERIAL HANDLING MACHINES •

Representatives in Principal Cities

BARBER GREENE

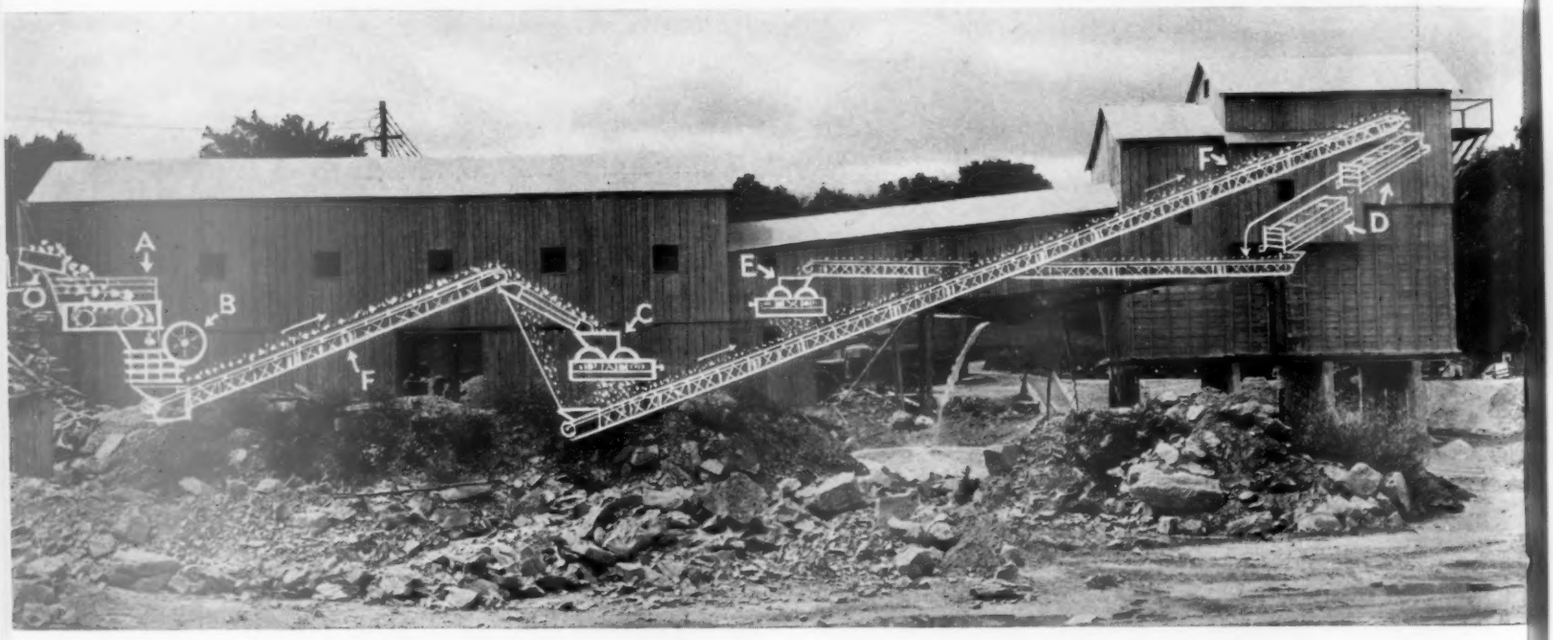
BRANCH OFFICES
Cleveland · Chicago · New York
Columbus · Boston · Detroit · ·
Cable Address · BARGREENE ·

PIONEER
Foto Facts
No. 9

Paul Frank, operating a large commercial quarry in North Vernon, Indiana, had several problems to solve:

1. *To take shovel size stone.*
2. *To increase production.*
3. *To control production of each size.*
4. *To change produce sizes without changing screens.*
5. *To produce dry and washed materials simultaneously.*

QUARRY PLANT *produces* WASHED ROCK and DRY "AG" STONE



Here's How Paul Frank Solved His Problems:

First, he consulted with Pioneer engineers and discussed his troubles and requirements. Then he made the following changes and additions to answer each of his problems:

1. To take shovel size stone, he installed a Pioneer Traveling Grizzly Feeder (A) and a Pioneer 24"x36" Primary Jaw Crusher. (B) The grizzly feeder takes the big rocks without man-handling, by-passes the small materials, and feeds a constant regulated flow to the Primary Crusher. The 2436 Primary Crusher takes any rocks the shovel will handle.

2. To increase production, he installed a Pioneer 54"x24" Roll Reduction Crusher (C). With the Primary Crusher set at 5" the 54" Roll Crusher will reduce the entire output down to 1⅜". It will handle wet sticky materials without plugging or delay. It has large capacity and a large "stage of reduction".

3. To control the percentage of each size produced, Paul Frank installed a Pioneer 40"x22" Roll Crusher (E) and arranged his screens so that any excess size could be conveyed to this Roll Crusher and reduced to a smaller size.

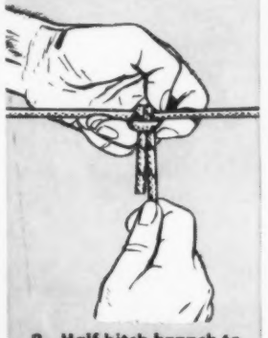
4. To change sizes, he equipped his second Vibrating Screen (D) with 1¼" opening in the top deck and ¾" in the second deck. When producing 1¼ to ⅛ the produces passing both decks go into the bunker. When producing ¾ to ⅛ a gate in the spout diverts the 1¼ to ¾ and it goes to the 40"x22" Roll Crusher (E) for further reduction.

5. To produce dry agricultural limestone and washed rock simultaneously, he arranged to dry screen out the fines in the first screen and do all the washing on the lower screen. This helps to keep the dust cloth clean and eliminates doughballs in the finished product.

The result is an efficient, well-balanced plant and the new items purchased were not an expense but an investment that has paid large regular dividends.

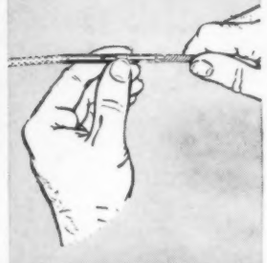
PIONEER ENGINEERING WORKS
1515 Central Avenue, Minneapolis, Minn., U. S. A.

1. Tie through cartridge.



2. Half hitch branch to main line.

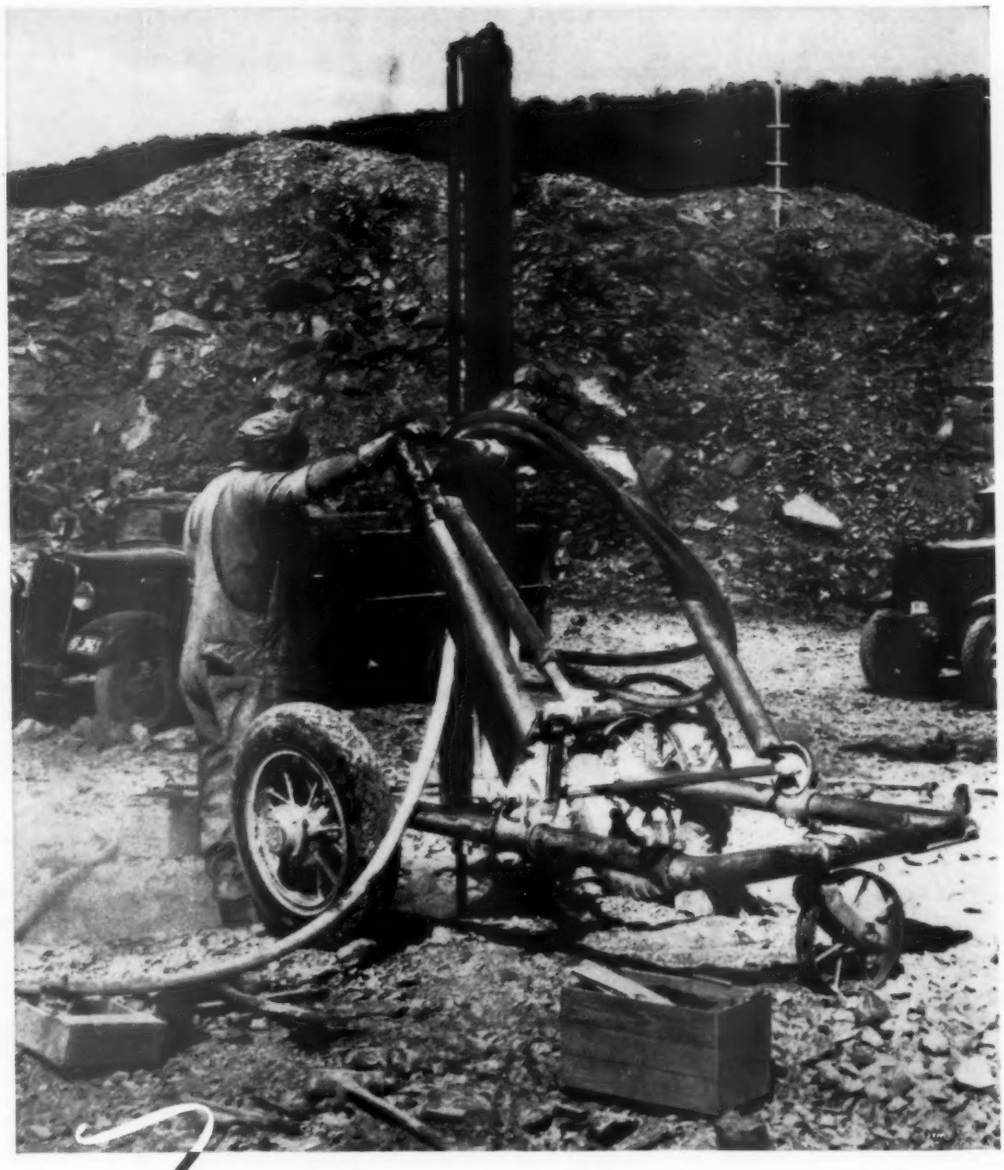
3. Connect main line lengths with *square* knot.



4. Fuse and cap on end of main line.

IMPORTANT

Branch lines should lead away from main lines at *right angles*. Avoid kinks and small loops.



For Wagon Drill Holes

Deep holes of medium size can be loaded more easily and fired more effectively when Primacord-Bickford Detonating Fuse is used. One cap on the end of the Primacord will fire one hole or a thousand. A powerful detonating wave is carried to each cartridge in the hole, *increasing its efficiency*. Primacord also connects all holes, in a rotation planned to promote better fragmentation. Light in weight, flexible, waterproof, easy to use. Write for booklet.

PB32

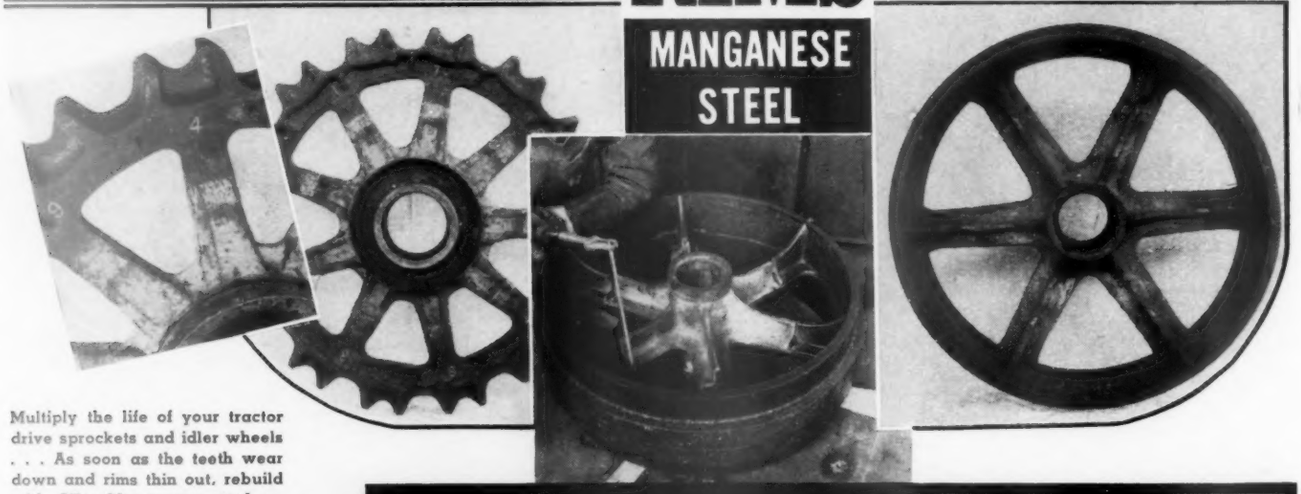
PRIMACORD BICKFORD
Detonating Fuse

THE ENSIGN-BICKFORD COMPANY • SIMSBURY, CONN.

Makers of Cordeau-Bickford Detonating Fuse — and Safety Fuse since 1836

Tractor DRIVE SPROCKET RIMS IDLER WHEEL

MANGANESE STEEL



Multiply the life of your tractor drive sprockets and idler wheels . . . As soon as the teeth wear down and rims thin out, rebuild with Alloy-Manganese steel renewable rims, designed for long, wear-resistant service and heat treated with just the right toughness to guard against breakage . . . They cost far less . . . Carried in stock for Caterpillar Tractors. Welding instructions with each rim.

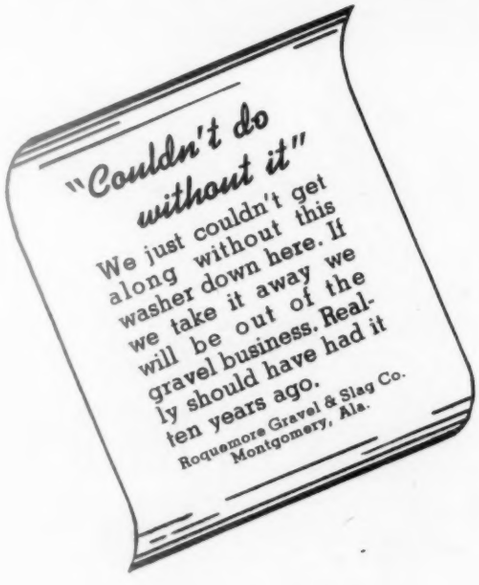
ALLOY STEEL & METALS CO.

1862 E. 55TH ST., LOS ANGELES, CALIF.

Manufacturers of PACIFIC CRUSHING & SCREENING UNITS • PACIFIC SLUSHING SCRAPERS & SHEAVE BLOCKS • Alloy-Manganese CRUSHER JAWS & MILL LINERS • PACIFIC ROCK BIT GRINDERS • HAND WINCHES • CRAWLER SHOES and Other Machinery Wearing Parts

A Manganese Steel Replacement Designed for Extra Long Rim Life

EAGLES are Indispensable to PROFITS


"Couldn't do without it"
We just couldn't get along without this washer down here. If we take it away we will be out of the gravel business. Really should have had it ten years ago.
Roquemore Gravel & Slag Co.
Montgomery, Ala.

. . . as shown by the experience of many Sand and Gravel operators. See letter at left.

Everywhere EAGLE Equipment is setting the "Production-and-Profit" pace.

EAGLE Washers have patented and exclusive features that insure a standout performance for long service life and operating economy. EAGLE-processed aggregate will meet the highest specifications.

EAGLE engineers provide competent advisory service that is known and respected throughout the industry.

Write for Bulletins of EAGLE Washers and other EAGLE products, including EAGLE Shale Planers, Double Roll Crushers, "Swintek" Dredging Ladder, etc.

EAGLE IRON WORKS

129 Holcomb Avenue — Des Moines, Iowa

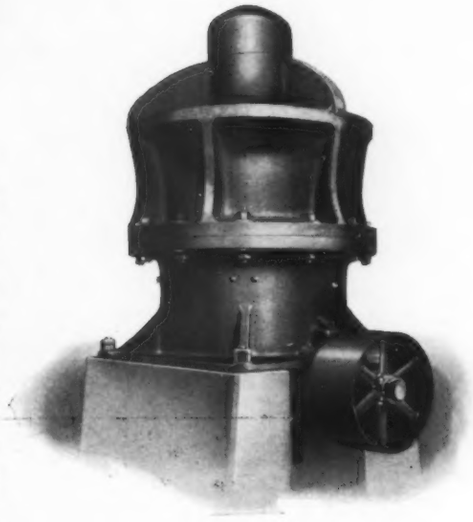
TY REDUCTION CRUSHER

When a new crusher sells in ever-increasing numbers for years on end—in a half dozen sizes, to operators located all over the world, who are engaged in a score of different industries, it certainly must have "a lot on the ball."

This result was achieved by a sort of super-salesmanship — on the part of the TY itself — appealing to the desire of owners for equipment that can be depended upon—at all times and under all conditions—to deliver wanted output regularly, in adequate quantity, at profitable cost.

It's the design that does it—strength to spare and so simple that anyone can understand it, scientifically lubricated, protected against dirt and grit and from breakage by tramp iron, non-chokable crushing parts that save power, reduce maintenance and boost production. In other words the machine has "what it takes," with all of the troubles left out.

Our representative has many interesting facts to tell you, and our Bulletin 2112 contains full details. Both are at your call. Write us today.



INVESTIGATE OUR TYPE H BLAKE CRUSHER (BULLETIN 1105), AND OUR MULTI-STAGE FINE REDUCTION CRUSHER—(BULLETIN 113).

TRAYLOR
ENGINEERING & MANUFACTURING CO.
MAIN OFFICE AND WORKS — ALLENTOWN, PENNA., U.S.A.

NEW YORK CITY, 3916 Empire State Bldg. · CHICAGO, 2051 One La Salle St. Bldg. · SALT LAKE CITY, 101 West Second South St. · LOS ANGELES, 919 Chester Williams Bldg. · SEATTLE, 6311-22d. Ave. N. E.

B. C. EQUIPMENT CO., LTD., 551 Howe St., Vancouver, B. C. · MANILA MACH. & SUPPLY CO., INC., Manila and Baguio, P. I. · MAQUINARIA INTERNACIONAL, S. R. L., Av. Francisco I. Madero No. 17, Desp. 214, Mexico, D. F.

Export Department—104 Pearl St., New York City. Foreign Sales Agencies: London, Lima, Sao Paulo, Rio de Janeiro, Buenos Aires, Santiago, Valparaiso, Antofagasta, Oruro, San Juan, P. R.

WELDED
ROLLED STEEL CONSTRUCTION for GREATER STRENGTH and SPEED

"NOW WE'RE ALL HAPPY! —THE BOSS BOUGHT A NEW WILLIAMS BUCKET"

"I have been operating cranes for 10 years," writes A. G. Grupe, veteran crane operator for the Edison Fuel and Materials Co., Chicago, "and have never used a better bucket. The boss always has a big smile when he sees me come up with material spilling over the sides."

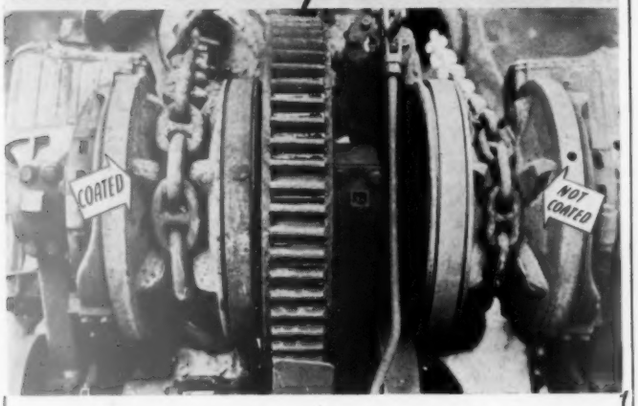
Operators and bosses all prefer Williams. Williams Welded Construction means longer wear . . . less breakage; faster work . . . more yardage! Williams buckets operate year in and year out with practically no cost for maintenance and repairs.

Prompt delivery and service through nation-wide distributors. Write for Free Bulletins *on any of the 11 types of Williams buckets.*

THE WELLMAN ENGINEERING CO. · 7014 Central Ave., Cleveland, Ohio

WILLIAMS *Buckets*
built by WELLMAN

DEFENSE *Against* WEAR



This Photo Proves That Hard-Surfacing Pays!

One look at the lugs on the anchor reel shown above clearly illustrates how Coast Metal is a vital defense against wear and means big savings in replacement costs for the Nicholson Terminal & Dock Company, Ecorse, Michigan, on their dredge boat.

The lugs on the left were coated with Coast Metal No. 112. Those on the right were uncoated. Both were used only one season—while the coated lugs (left) show no wear, thanks to the overlay of Coast Metal, the uncoated ones (right) show extreme wear, resulting in inefficiency of operation, impaired safety and costly replacement.

Let us show you many other ways in which Coast Metal will mean real defense against wear, where the going is tough. For instance, on dredge operations, Coast Metals give exceptionally good results on manganese-steel pump shells and impellers in resisting severe abrasion from sand and gravel. *Distributors: Several desirable territories still available.*

Write for all the facts today

COAST METALS INC.
Canton, O.

MORE PERFORMANCE PER POUND— —MORE FOOTAGE PER SHIFT!

67 POUNDS

GARDNER-DENVER S-73 SINKING DRILL

- Speed and power to drill faster, in harder ground.
- Uses no more air than the average 55-lb. drill.
- Ability to rotate in tight or fitchery ground, due to powerful four-pawl rotation.
- Excellent holding characteristics enable the drill-runner to maintain a high rate of drilling speed throughout the shift.

31 POUNDS

GARDNER-DENVER S-33 SINKING DRILL

- Speed and reliability that lift it far out of its weight class.
- Light in weight for easy holding in the hard-to-reach places.
- Same four-pawl rotation used in the heavier Gardner-Denver drills.
- Ability to clean the hole thoroughly with live air at full line pressure.

Choose the Gardner-Denver S-73 Sinker for speed on your general operations —or choose the Gardner-Denver S-33 Sinker for versatility on your lighter jobs. They'll both give you greater footage with lower air consumption. For full information, write Gardner-Denver Company, Quincy, Illinois.

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Since 1859

DEFENSE
AGAINST HIGH COST DEWATERING LINES

● Here is *one* light-weight pipe built for heavy-duty service. Naylor's exclusive Lockseam Spiralweld provides the extra structural strength, leak-tightness and safety needed for loads usually requiring heavier-wall pipe. Thus, you can install Naylor for both high and low pressure lines and still get the savings of light-weight pipe. Sizes from 4″ to 30″ in diameter. Complete fittings and fabrication service to meet your requirements.

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NAYLOR LOCKSEAM SPIRALWELD **PIPE**

YOU WOULDN'T BAT WITH A *Broomstick*

WHY LET A POOR BUCKET ROB YOUR DRAGLINE OF ITS DIGGING POWER?

To boost a ball over the fence you need a good, husky bat. To boost the production of your dragline—you need a Page AUTOMATIC Bucket.

A Page Bucket AUTOMATICALLY lands ready to dig . . . bites right in . . . loads faster . . . and handles easier. The result: MORE PAY DIRT MOVED PER SHIFT—more "gravy" for you!

Operators report that by using Page AUTOMATICS they have increased their yardage 5% to 50%, with NO increase in operating cost.

Don't let a "broomstick bucket" sap the digging power of YOUR dragline. Mail the coupon below and get the facts about a Page AUTOMATIC Bucket suited to your job. Do it TODAY!

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Chicago, Illinois

PAGE *Automatic* **DRAGLINE BUCKETS**

Page Buckets are built in sizes from ⅜ to 15 cubic yards capacity, and in three weight groups . . . a bucket for every job.

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Without obligating me in any way, mail a copy of your new descriptive bulletin titled "Your Dragline CAN Move Dirt Faster."

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PROTECT CONVEYOR BUCKETS WITH COATED STOODY SELF-HARDENING!

★ An easy way to maintain the carrying capacity of your conveyor buckets is to weld a single bead of Coated Stoody Self-Hardening around the top of each lip. Stoody Self-Hardening deposits are so tough and wear-resistant that buckets faced with this metal retain their original size and full carrying capacity long after ordinary buckets are worn out. The 3/16" diameter Coated Stoody Self-Hardening is priced at only 50c per pound f.o.b. Whittier, Calif. Why not order a few pounds—apply it to your bucket lips and keep them carrying a full pay load?

Coated Stoody Self-Hardening and other Stoody hard-facing metals can be obtained from any of the Stoody distributors listed below.

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Commercial Gas Co.
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Hendrie & Bolthoff Mfg. & Supply Co.
Denver, Colorado

Hopper Machine Works
Bakersfield, California

Magnolia-Airco Gas Products Company
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William M. Orr Company
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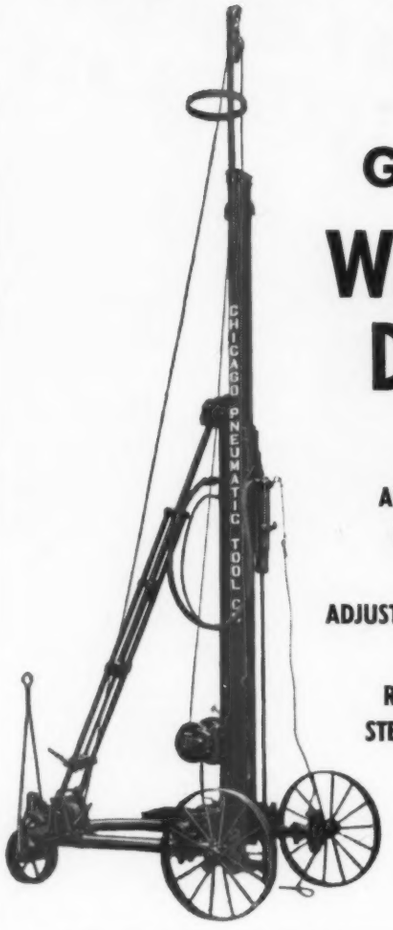
NEW!

CP G-500 WAGON DRILL



FOUR WAY ADJUSTMENT OF DRILL TOWER

•

ADJUSTABLE REAR WHEELS

•

RIGID TUBULAR STEEL MAIN FRAME

Write for complete data on the new CP G-500 Wagon Drill . . . with a four-way adjustable tilting tower which permits quick and easy adjustment through 25° either side of vertical . . . a 7½° lateral adjustment which facilitates drilling of angle holes and brings the tower to vertical on uneven ground . . . adjustable wheels which can be swung around 90° tandem for line drilling or for drilling close to bank.

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HERE IS HOW TO DO IT AT OUR EXPENSE

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For water, steam and acid conditions.

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THAT ARRESTS PROGRESSIVE WEAR

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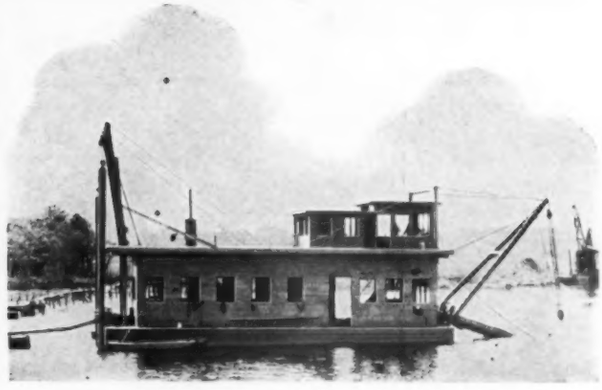
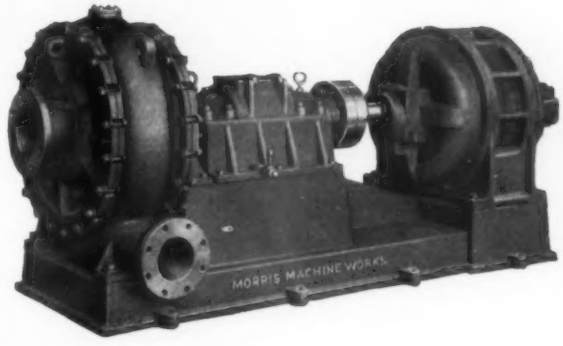
The MORRIS HYDRAULIC COLUMN

News of interest to Centrifugal Pump Users



If you need more dredge capacity

. . . let the Morris engineers check your present hydraulic dredge and requirements. Possibly a slight change in your equipment or operating methods may materially increase your production. It's worth investigation. Your request for recommendations will involve no obligation.

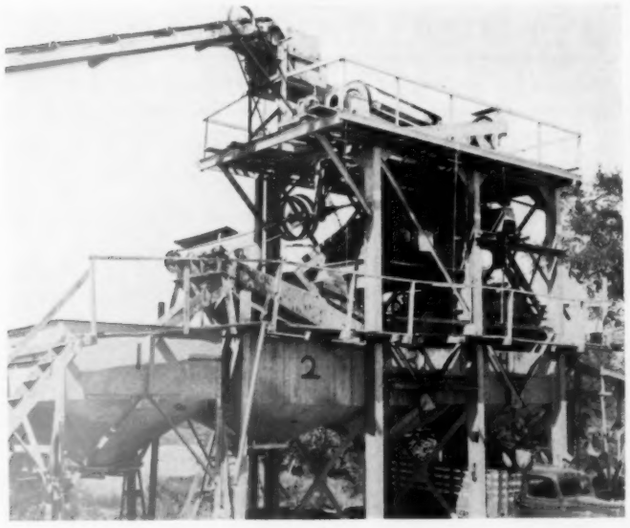


If you need more pump capacity

. . . let the Morris engineers analyze your present pump and service conditions. A new impeller in your present Morris pump, or a new Morris pump with your present motor may make an astonishing difference in efficiency and capacity. Morris recommendations are authoritative because they are based on 76 years of experience.

For authoritative recommendations on any pumping or dredging problem, write to Morris Machine Works, Baldwinsville, N. Y. Representatives in principal cities. Export Office: 50 Church St., New York City.

Depend on DIAMOND for Volume Production at Low Cost



Diamond crushing, screening, washing and conveying equipment can be furnished in any combination to suit the particular needs of any quarry. Each piece of Diamond equipment is designed along the most modern lines to give the quarryman maximum production at lowest cost.

Our large engineering staff will gladly consult with you, and make suggestion sketches and recommendations to suit your particular needs.

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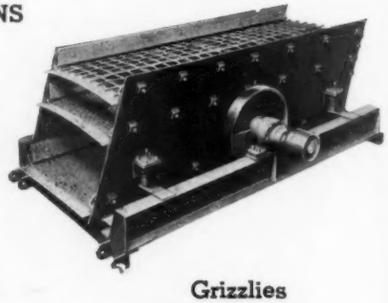
There are many reasons why Diamond vibrator screens are famous among quarry men. They are positive in action, may be hung with shackles or suspended by cables and are adjustable both for balance and angle of incline.



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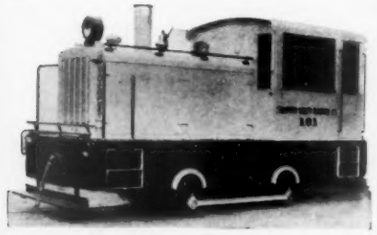

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A DIVISION OF DAVENPORT BESLER CORPORATION, DAVENPORT, IOWA

McLANAHAN EQUIPMENT

for ROCK— SAND—GRAVEL

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is transmitted to the dipper teeth through quiet, efficient, helical cut gears.

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are used at every important bearing point, to conserve power and reduce fuel and lubrication costs.

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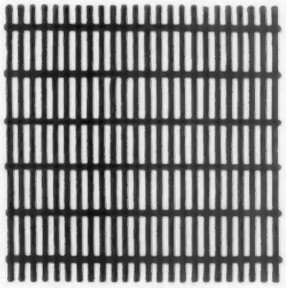

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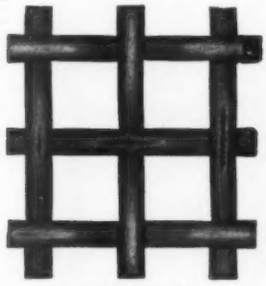
Available in Square Mesh and Rolled Slot. A trial will convince you of the superiority.



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the NEW SUPER MODEL **MAMMOTH** LIMESTONE CARRIER & SPREADER

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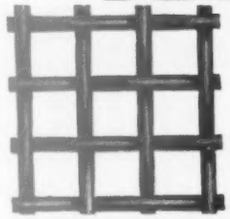

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On your equipment NOW will insure continuous operation for months to come.

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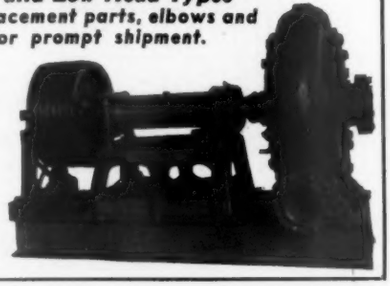

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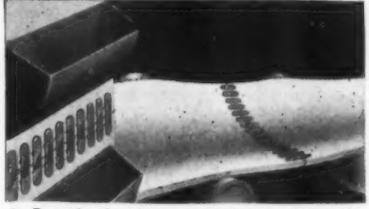
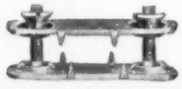


• Avoid shutdowns and lengthen the life of your conveyor belts and bucket elevator belts by using Flexco HD belt fasteners and rip plates. Thousands of companies have stepped up the performance of conveyor lines and cut costs by using Flexco methods.



• **FLEXCO H D BELT FASTENERS** make a strong, tight butt joint with long life. Recessed plates embed in belt, compress belt ends and prevent ply separation. Six sizes in steel and alloys.

Bulletin F-100 shows exactly how to make tight butt joints in conveyor belts with Flexco HD Belt Fasteners. Also illustrates step by step the latest practice in repairing rips and putting in patches.

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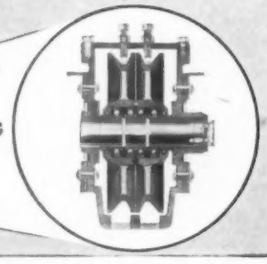
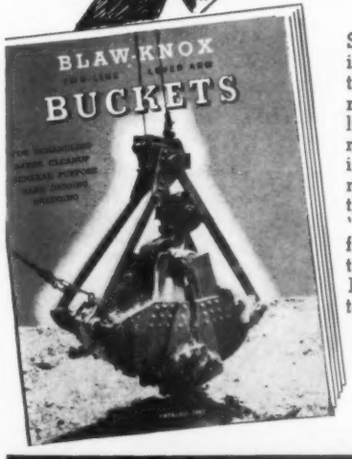




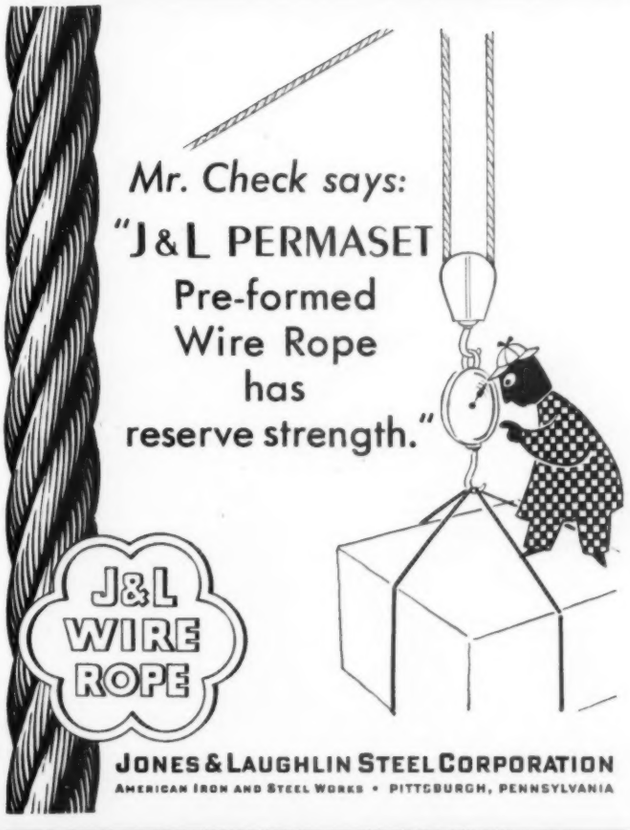
Sealed ball bearing sheaves in the lever arm reduce lost time and expense of bearing replacement, increase cable life and reduce friction, materially improving operating efficiency. This, and many other better features, that make BLAW-KNOX the "wise" buy in buckets are fully explained and illustrated in NEW CATALOG 1757. Send for your copy today.

BLAW-KNOX DIVISION
of Blaw-Knox Company
Farmers Bank Bldg.
Pittsburgh, Pa.

29

BLAW-KNOX
BUCKETS

BLAW-KNOX BINS AND BATCHERS · ROAD FORMS · STREET FORMS · CONCRETE SPREADERS · TAMPING ROLLERS · VIBRATORS
CONCRETE BUCKETS · CLAMSHELL BUCKETS · TRUCK MIXERS · STRIPING MACHINES · TURNTABLES · ROAD FINISHERS · STEEL FORMS



JONES & LAUGHLIN STEEL CORPORATION
AMERICAN IRON AND STEEL WORKS • PITTSBURGH, PENNSYLVANIA

LOCOMOTIVES

1—4 Wheel Saddle Tank Std. Gauge	20 Tons
1—4 Wheel Saddle Tank Std. Gauge	30 Tons
2—6 Wheel Saddle Tanks Std. Gauge	50 Tons
1—4 Wheel Gasoline Std. Gauge	12 Tons
1—4 Wheel Gasoline Std. Gauge	8 Tons

Also Heavier Power, Side Dump, Hopper and Gondola Cars

Railway Accessories Co.

Carew Tower Cincinnati, Ohio

FOR SALE—INDUSTRIAL LOCOMOTIVES

1 Plymouth type No. 2, 3½ ton, 24" gauge
1 Plymouth 3 ton, 36" gauge
1 Plymouth 4½ ton, 36" gauge
1 Plymouth 7 ton, 36" gauge

DUMP CARS—
Koppel 4 yd. double side dump
2 yd. double side dump 36" gauge
Western Grader 2 yd. 24" gauge

GASOLINE ENGINES—
2 Miller twin cylinders, 190 H.P. each, friction clutch, line shafting, etc.
1 Bessemer 20 H.P.

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Youngstown, Ohio

Rebuilt Byers ¾ yd. shovel, 45,000 lb., New 80 H.P. Waukesha engine, perfect, $3,750.00.

Koehring H.D. 1 yd. shovel. Good, Gears and motor renewed, $2,500.00.

100 H.P. Buda Diesel Engine with clutch, radiator, rebuilt, 2 cyl. gasoline starting engine, $1,000.00.

Universal Portable Crushing Plant, 20x36 Roller Bearing Jaw, double rolls, vibrating screens. Bins. Conveyors with two 100 H.P. LH. C. Diesel engines. Complete. Bargain.

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USED EQUIPMENT IMMEDIATE DELIVERY

	Condition
One (1) 9"x16" bronze bearing DIAMOND jaw crusher complete with flywheels and Model P2877D2 LeRoi motor mounted on trailer unit with steel wheels	New
Two (2) pitman assemblies with S.K.F. bearings including main bearings for 10"x20" jaw crusher	New
One (1) 15"x36" roller bearing DIAMOND jaw crusher	New
One (1) 15x36 pitman assembly—new design with 8" shaft, including main bearings	New
One (1) bucket elevator 32'0" centers, rigid type, with buckets 12"x6"x7¾" mounted on belt	New
*Five (5) pitman assemblies for 10x20 jaw crusher, bearings S.K.F. type	Slightly Used
*One (1) pitman assembly for 10x20 jaw crusher, bearings Timken type	Rebuilt
One (1) 10x20 roller bearing DIAMOND jaw crusher equipped with Timken bearings	Rebuilt
*Three (3) 10x36 pitman assemblies for 10x36 jaw crusher	Rebuilt
*One (1) 15x36 pitman assembly complete.	Rebuilt
One (1) 20'0" bucket elevator with buckets 10"x6"x7¾" mounted on chain	Rebuilt
One (1) 30"x10'0" double shaker screen	Slightly Used
One (1) Grizzly and hooper 6'8x6'8—with 8" sq. openings and 20"x3'0" plate feeder	Good Condition
Two (2) Quarry plants with 10x20 anti-friction bearing jaw crushers and bucket elevators, mounted on trucks with four steel wheels	New
Two (2) 30 cubic yard bins, 3-compartment, no jack legs	New
One (1) #25 hog, anti-friction bearing type with cast steel discs	New
Six (6) Steel wheels 40" dia. x 16" face to take 4" Hyatt bearings	New
Four (4) Steel wheels 40" dia. x 10" face to take 4" Hyatt bearings	New
Four (4) Steel wheels 28" dia. x 4" face, bore 1¾"	New
Ten (10) Steel wheels 28" dia. x 5" face, bore 1 15/16"	New
Eight (8) Steel wheels 24" dia. x 3½" face, bore 13/8"	New
Four (4) Steel wheels 28" dia. x 14" face, bore 4" Hyatt	New
One (1) Allis-Chalmers motor, 25 H.P.	Reconditioned
One (1) Allis-Chalmers motor, 60 H.P.	Reconditioned

* The above pitman assemblies can be installed in new bases and furnished as complete machines.

DIAMOND IRON WORKS, INC., AND MAHR MANUFACTURING COMPANY DIV.
Minneapolis Minnesota

FOR SALE or RENT

1—I.R. 210 cu. ft. 2-stage, gasoline portable Air Compressor.
1—I.R. 315 cu. ft. 2-stage, gasoline, portable Air Compressor.
1—Model 371 MARION Caterpillar Diesel Combination, Shovel, Crane and Dragline. 2 cu. yd. capacity.
1—INDUSTRIAL BROWNHOIST 15-ton Caterpillar gasoline crane.
1—NORTHWEST No. 5 Combination Crane and Shovel. Gasoline. Shop No. 3438.
1—NORTHWEST Model No. 4 Gasoline Crane with 100' boom. Shop No. 3226.
1—LITTLE GENERAL Gasoline Shovel and Backhoe. ½ yd. capacity. Six cylinder engine.
2—20-ton MC MYLER, 8-wheel, steam Locomotive Cranes.
1—LAMBERT 10½x12, 3-drum steam hoist.
1—LIDGERWOOD 35 H.P. D/D Gasoline Hoist.
2—RANSOME 1½-yd. CONCRETE MIXERS. Electric Driven.
1—12-ton DAVENPORT, standard gauge, Gasoline Locomotive. Air Brakes.
1—8-ton VULCAN, standard gauge, Gasoline Locomotive.

Atlantic Equipment Corporation
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Evergreen 6363

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One No. 3 Schaeffer Continuous Hydrator complete with Poidometer and motor. Fitted with Kuntz Dust Control. Entirely reconditioned.

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Inventory of Equipment of Sand Pit at Hacketstown, N. J.—

1—10" Centrif. Pump. Reversible Speed; 1—200 H.P. Crocker Wheeler Motor; 3 Ph. 60 Cyl.—585 R.P.M.; 15, 10, and 7½ H.P. Motors; 1 Centrif. Priming Pump; 4—Link-Belt Cone Sand Separators. Diam. 8 ft., length 10 ft.; 10, 8, 6, 4, and 1½ in. pipe; Pontoons; Loading Gates. All equipment slightly used.

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ALL SIZES FROM 2¼ inch dia. to ⅝" dia. Suitable for hoisting, draglines, guylines, etc. Send for complete list.

Immediate shipment from stock.

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This excellent property contains good gravel and is located 40 miles from the excellent Detroit, Mich., market on a main line railroad, a lake and stream for water supply. Write

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WANTED: ENGINEER

Mining Engineer for prospecting, sampling, and planning operations preliminary to surface-mining of clay deposits in south. Permanent position with established producing company. Give qualifications. Address

BOX 514
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Jaw Crushers—4"x8" up to 66"x84".
Crushing Rolls—16"x10" up to 54"x24"
Gyratory Crushers—No. 3 up to Mammoth
Ring Roll Mills—No. 0, No. 1, No. 1½ and No. 2.
Swing Hammer Mills.
Rotary Fine Crushers—No. 0, No. 1, No. 1½ and No. 2.
Direct Heat Rotary Dryers—3½'x25', 4'x30', 5'x30', 5½'x40', 6'x50', 7'x50' and 8'x50'.
Semi-indirect heat Dryers—5'x30' and 8½'x75'.
Cement Kilns—3' up to 8' diameter.
Hardinge, Marcy & Fuller-Lehigh Mills.
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New Dryers built for all purposes.

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3—BRAND NEW Jaw Crushers 9"x15" and 10"x20".
1—8"x15" CLIMAX No. 1½ Jaw Crusher.
1—9"x16" CLIMAX No. 2 Jaw Crusher.
1—12"x26" CHAMPION No. 6 Jaw Crusher.
2—10"x16" NEW HOLLAND 4 roll crushers.
2—M-20 QUAKER CITY Hammer Mills.
1—No. 258 New Holland Swing Hammer Pulverizer. 6"x12" feed opening.
2—3'x5' LINK-BELT Vibrating Screens.
1—No. 1 STURTEVANT Open Door Rotary.
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1—150 HP F-M Diesel Engine—Fine Cond.
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1—100 HP 220-440 V. Synchronous Motor.
2—150 KVA Gens. D/C Skinner Unaflows.
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1—50,000 Gal. Steel Water Tank & Tower.
1—2 Yd. Steel Gantry Traveling Crane.
We have a nice Stock Assortment of AC & DC Motors & Pumps—All Sizes—Try Us.

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In 2', 3', 4' and 5½' Sizes

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Bloomington, Indiana

"E. C. A" REBUILT EQUIPMENT means LARGER profits!

Below is a partial list of our large stock. Send for complete list.

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2—Sullivan 1573 cu. ft. displacement, 2 stg. cyl., size 22x13x14"; with intercooler, Class WM-31, direct connected to 250 HP 440-volt, 60 cy., 3 ph., A.C. Syn. Mtrs.

30—Portable gasoline driven air compressors all makes—sizes 310', 260', 220', 160', 110'.

BINS

12—1—150-ton Johnson, 3-comp.; 1—150-ton Blaw-Knox, 2-comp.; 1—120-ton Blaw-Knox, 4 comp.; and the following 2-comp. bins: 2—118-ton Blaw-Knox, 1—117-ton Blaw-Knox, 1—72-ton Blaw-Knox, 1—75-ton Butler, 1—51-ton Blaw-Knox, 1—35-ton Blaw-Knox, 2—30-ton Johnson offset bins —both with or without weigh batchers.

CRANES, DRAGLINES & SHOVELS

1—Link-Belt, K-55, Serial No. 1698, 70' boom, 2 yd. bucket, also have 2 yd. shovel attachment.

1—Link-Belt K-48, Serial No. 1728 with 60' boom 2 yd.

1—Northwest Model 5, Serial No. 3572 with 50' boom, 1½ yd.; also pull shovel 1¼ yd. and

2—Northwest Model 4, Serial Nos. 3441, 3445 with 40' boom 1 yd.; also 1-yd. pull shovel.

1—Northwest Model 104, Serial No. 2079, 45' boom, 1¼ yd. bucket; with 1 yd. shovel attachment.

1—Link-Belt, Model K-42, Serial No. 1265, 45' boom, 1¼ yd. bucket, also 1 yd. trench hoe attachment or 1¼ yd. shovel front.

2—Northwest Model 105, Serial Nos. 2556, 1645, 40' boom, 1 yd. bucket with one shovel attachment.

1—Bucyrus-Erie Model 1035, Ser. No. 11034, 50' boom with 1 yd. bucket.

2—Osgood Heavy Duty, Serial No. 2069 and No. 2087, 40' boom, 1 yd. bucket and with 1 yd. shovel attachment.

1—Thew, ¾ yd. Gasoline Shovel with ¾ yd. shovel front and 40' crane boom. Serial No. 2801.

1—Koehring Model 301, Serial No. 544, 40' boom ¾ yd. bucket.

1—Northwest No. 2 crane, new 1937 with 40' boom.

1—Byers Bearcat Model 27, Serial No. 5289, 30' boom, ½ cl. sw., ½ yd. bucket.

1—Erie Steam Crane & Shovel with 40' crane boom, with or without ¾ yd. shovel front.

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With any style mounting, wagon, column or tripod.

22—Ingersoll-Rand Models X71, Weight 220 lbs.; S-70, Wght. 185 lbs.; R72, Wght. 175 lbs. for 1¼" steel.

10—Sullivan Models FG-3, Wght. 250 lbs. for 1½" steel; Mod. TJ-10, Wght. 161 lbs. for 1¼" steel.

4—Gardner Denver Model 17, Wght. 180 lbs. for 1¼" steel.

JACK HAMMERS

53—Jackhammers for 1" and ⅞" Steel—Ing. Rand Models S49, DCR23, Gardner Denver Mod. 37 and 11D. Also riveting and chipping hammers, Paving breakers, drills and reamers, grinders, etc.

CRUSHERS

5—Gyratory crushers: 1—No. 5 Allis-Chalmers; 1—No. 5 Austin; 1—No. 5 Gates; 1—No. 3 McCully; 1—No. 0 McCully.

10—Jaw Crushers: 3—15x36" Universal; 1—15x36" Cedar Rapids; 1—15x26" Champion; 1—12x20" Acme; 2—10x 20" Climax No. 21½; 1—9x16" Telsmith No. 9A; 1—9x15" Champion.

1—Set of Allis-Chalmers, smooth type crushing rolls, 42x16".

DERRICKS

3—steel Guy Derricks; 1—15 ton Terry, 115 ft. mast, 100' boom, 1—10 ton American, 115' mast, 100' boom, 1—6 ton Bedford, 90' mast, 80' boom.

6—steel stiff leg; 1—25-ton just, 77' boom, 1—18 ton Double, 75' boom, 1—15 ton just, 65' boom, 1—15 ton Clyde, 50' boom, 1—10 ton Insley, 80' boom.

HOISTS

1—2 Yd. Thomas 2 speed Class I. Cableway excavator hoist with 150 HP electric motor.

1—National 50 HP dragscraper hoist for handling 1 yd. bucket with 50 HP electric or gas power.

1—1 Yd. Cedar Rapids 2 speed dragscraper hoist with 50 HP electric or gas power.

1—1 Yd. Kern variable speed drag. scraper hoist powered by 50 HP electric motor.

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14—Electric and gas powered locomotives, std., 36" and 24" ga.; 1—12-ton Plymouth Std. ga.; 1—7-ton Plymouth, 1—4-ton Whitcomb, 1—6-ton Brookville, 1—8-ton Whitcomb, 2—4-ton Vulcan, 2—4-ton Whitcomb, 1—3½-ton Plymouth, 1—3-ton Whitcomb.

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15—Koppel 1½ yd., 24" ga., 2 way dump, U-body all steel roller bearings.

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COMPLETE MACHINERY FOR 10" GRAVEL DREDGE

10" MORRIS Heavy Duty, manganese steel dredge pump directly connected to 250 HP, 440 volt, 3-phase, 60 cycle, wound rotor motor with control.

10" Traveling Chain Cutter, approximately 42' long with motor and starter.

3-Drum Dredge Hoist with motor and starter.

Priming and General Service Pump with motor and starter.

Box 510

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KILNS: 8' x 80', 9' x 142', 9' x 160'.

DRYERS: 5' x 35', 4' x 40', 5½' x 32', 5'6" x 40', 5' x 50'.

CRUSHING ROLLS: 6" x 5", 24" x 14", 42" x 16".

JAW CRUSHERS: 16" x 24", 10" x 36", 48" x 60".

BALL MILLS: 5' x 8', 6' x 8', 6' x 22'.

HARDINGE MILLS: 4½' x 16", 5' x 22", 6' x 22", 8' x 30".

RAYMOND MILLS: No. 0000, 00, 1, also 3, 4, and 5 rolls.

HAMMER MILLS: Williams, Gruendler, J.B., etc.

We Purchase Single Items to Complete Plants.

BRILL EQUIPMENT CORPORATION
183 VARICK ST., NEW YORK CITY

8—Identical 275 KW, 250 volt, 230/250 RPM, **GE** modern **D.C. Generators** with direct connected 125 volt Exciters and Control .....$2000.00 each

8—Identical 625 HP, **GE**, 500 volt D.C. **Interpole Motors**, 90/160 RPM with Control .....$2000.00 each

4—1250 HP, **GE**, 500 or 1000 volt, **D.C. Motors**, Interpole, 90/160 RPM with Control .....$4000.00 each

8—500 HP, 6-cylinder modern **Diesel Engines**, 230/250 RPM.....$7200.00 each

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½ yd. No. 35 Universal Lorain Gas Shovel.
3'x8'—2 deck Niagara Screen.
1030 Roller Bearing Jaw Crusher.
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36x18 Double Roll Crusher.
21x18 Double Roll Crusher.
18x18 Double Roll Crusher.
16x16 Double Roll Crusher.
14x16 Double Roll Crusher.
18x36 Single Roll-Wedge Crusher.
32" Telsmith Reduction Crusher.
8" Traylor Bulldog Gyratory.
4'x6' KVS Ball Mill.
100 HP Buda Diesel Engine.
100 HP Fairbanks Morse Semi-Diesel.
125 HP Buckeye Oil Engine.

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LOCOMOTIVE: American 4 wheel, 40 ton Steam Saddle Tank, 190 lb. boiler, excellent condition.

DUMP CARS: Two Clark 30 cu. yd. capacity Air Dump Cars, good condition.

Smith 56-S Tilting Type Concrete Mixer, 2 cubic yard capacity, excellent condition.

E. E. FORT

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FOR SALE

No. 9 Allis-Chalmers Gates Crusher.
3 yard double friction hoist.
Heavy Duty Haiss Bucket Loader.

Inspect in operation at

MORRIS LIMESTONE COMPANY
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SURPLUS EQUIPMENT FOR SALE

2—**Jaeger Truck Mixers** on Ford V-8s, 1½ yd. each $850.00

1—**Lidgerwood** 50 H.P. **Electric Hoist**..... 500.00

190' **American Tubular Tower** with platform, Bucket Hopper, Top and Bottom Shives. 950.00

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8-B Telsmith primary crusher, high speed shafts and roller bearings. Good condition.

Robins 2 x 4 single deck vibrating screen. Price $100.00.

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2—Gas & Elect. Pumpcrete units, Cap. 60 cy., Pugmixer, complete.

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1—6'x35' Steam Tube Rotary Dryer.

1—240 HP. F-M Diesel.

1—3'x30' Vulcan Dryer.

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One used Multi-Foote Paver, Model 14-E. First Class Condition.

Reasonable for cash.

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No. 80 Austin Western Portable Crushing and Screening Plant.
36x60" Fairmount Single Roll Crusher.
Superior 13, Kennedy 37, Allis-C. 9 Gyratory Crushers.
18x38 Austin, 36x24 Farrell, 36x28 & 48x60 Traylor Jaw.
No. 5 Austin Gyratory over 2' Symons Cone Crusher.
2—6x12' Ball Mills, Silex Lined with balls.
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1 yd. Keisler Clamshell.
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Diesel, Nat. Gas & Steam Engines, with & without gens.

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As Never Before - - - - You Save Time — You Save MONEY with CONSOLIDATED *Used Machinery*

SPECIAL
6—UNUSED NO. 900 KELLY FILTERS, Twin Units of 450 sq. ft. each.

GYRATORY CRUSHERS
36" Allis-Chalmers Style "N," short shaft; 42" Gates; 20" Kennedy Gearless; 20" Traylor; 20" Allis-Chalmers Superior McCully; 15" Telsmith; 13" Superior McCully and smaller sizes.

GYRATORY FINISHING CRUSHERS
1'8" and 2'4" Traylor TY; 410-TZ. 4' Traylor; No. 19, 25, 37 and 49 Kennedy.

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30x42" Buchanan Type "C"; 48x42 Traylor Bull-dog; 66x86 Traylor; 48x60 Traylor; 36x24 Farrel; 18x36 Farrel; 24x36 Allis-Chalmers; 8x36 Universal Roll Jaw; 18x30 Allis-Chalmers and smaller sizes.

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8'x125', 8'x110', 6'x120', 6'x60'.

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Ruggles-Coles, double shell: 5'x20', 5'x30', 5'6"x60', 80"x45', 104"x60', 104"x85'. Single shell: 4'x 30', 5'x30', 6'x40', 6'x50', 6'x60', 8'x60', 8'8" x85'.

COMPLETE PLANT FOR FINE PULVERIZING OF SILICA OR OTHER PRODUCTS. MAIN ITEMS CONSIST OF:
4'x20' Indirect Heat Rotary Dryer.
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8' Gayco Centrifugal Classifier.
200 H.P. DeLaVergne Diesel Engine.
Belt Conveyors, Bucket Elevators, Steel Storage Tanks, Pumps, Air Compressors, etc.

6'x12' ROD MILLS
Hardinge straight side Rod Mill, Titanite lined, herringbone steel gears, enclosed gear drive unit.

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Ball Mills: 3'x5', 5'x10', 6'x6', 6'x8'.
Rod Mills: 4'x8', 6'x12' Hardinge, straight side; 5'x 10', 5'x12' Allis-Chalmers.
Tube Mills: 3'x12', 4'x16', 5'x20', 5'x35'.

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Allis-Chalmers 5'x10', 3 deck; Stephen-Adamson 4'x8', 2 deck; Tyler Hummer 3'x5', 4'x5', 1 and 2 decks; 4—4'x7' Leahy, two decks; 4'x8' Huron, 1 deck; 3—4'x7' Jeffrey-Traylor, 2 decks; Symons 4'x10', 4'x 12', 5'x10', 2 decks. Also Rotex, Robinson and other makes.

RAYMOND PULVERIZERS
2, 3 and 4 roll High Side; Nos. 0000, 00, 1 and 3, Beater type—also Nos. 55, 60, 90 Imp type, also No. 40 Imp with 6' Centrifugal Separator.

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2—Sullivan Type WN-102, two stage, 550', New 1939.
2—Ingersoll-Rand 90-CH, two stage, air cooled, electric driven, on skids, 360 CFM, 1939.
1—Ingersoll-Rand 315-A Portable.
2—Ingersoll-Rand 830 cu.ft. air cooled, electric driven, 100 lbs. 1939.
1—Chicago Pneumatic OCE 20 x 12 x 14; synchronous motor.

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10' Sturtevant; 8', 10', 12' Gayco; 6' Raymond; also 5' dia. Raymond "Whizzer" for attachment to roller mill.

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1905 Ft.	24"	5	1/8"	1/16"	Conveyor
250 Ft.	24"	6	1/8"	1/16"	Elevator
1298 Ft.	24"	4	1/8"	1/16"	Conveyor
250 Ft.	22"	8	1/16"	1/16"	Elevator
210 Ft.	22"	8	Friction		Elevator
874 Ft.	20"	5	1/8"	1/16"	Conveyor
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750 Ft.	16"	4	1/8"	1/16"	Conveyor
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24x24 & 36x16 & 36x20 Diamond Double Roll.

JAW CRUSHERS

10x8, 13x7 1/2, 14x7, 15x9, 15x10, 16x9, 16x12, 16x10, 18x11, 20x8, 20x6, 20x10, 20x12, 20x11, 26x12, 30x15, 30x13, 36x30, 36x18, 36x14, 36x15, 36x9, 36x6, 38x18, 36x10, 36x24, 42x9, 48x36, 60x42, 84x66, 36x16, 9x36.
30x10 Gruendler Roller Bearing.

CONE & GYRATORY CRUSHERS

18 in., 24 in., 30 in., 36 in. and 48 in. Symons Disc.
21K & 18N Allis Chalmers.
4—10 TZ Traylor 4 Ft. Gyratory.
4—Nos. 5, 3 & 6 Austin Gyratory.
2—Traylor T-12 Bulldog Gyratory.
5 in. Traylor T. Gyratory, Telsmith No. 9.
17 Gates K—Nos. 3, 4, 5, 6, 7 1/2, 8 & 9 1/2.
10 Inch Austin Model 105.
6, 10 & 13 Inch Superior McCullus.
KENNEDY: Nos. 19, 25, 27, 39 & 49.
16" Traylor.
7 Ft., 5 Ft. and 3 Ft. Symons Cone.

DRILLS

4—SANDERSONS 14 & LOOMIS 44.
7—Ingersoll-Rand Wagon Drills, FB & M2.
29T ARMSTRONG Well Drill.

HOISTING ENGINES

7 Gasoline 15, 40, 60 & 100 H.P.
17 Steam 7x10, 8 1/4x10 and 10x12.
8 Electric 20, 35, 50, 60, 100 & 150 H.P.

HAMMER MILLS

4 Jeffreys: 24x18-A, 36x24-B, 42x36-E & 42x48-B.
Williams No. 1 Jumbo Jr., & No. 6 Universal.
Nos. 4, 6 & 8 Williams Jumbo.
No. 36 Am. Ring Roll.
Gruendler No. 6X.

STEEL BINS

72 Ton BLAW-KNOX 2 Compt.; also 250 ton.
100 Ton BLAW-KNOX 2 Compt.

CEMENT BIN

400 Bbl. Portable BUTLER Bulk Cement Bin with Fuller Full Automatic Electric Push Button Weigh Batcher.

SYNCHRONOUS MOTOR GENERATORS

100 K.W. RIDGWAY 3/60/2200-250-275 volt.
150 K.W. GEN. ELEC. 3/60/2200-250-275 volt.
200 K.W. RIDGWAY 3/60/2200-250-275 v., 900 rpm.

DIESEL GENERATORS

240 K.W. F.M. 3/60/2300 v.
300 K.W. Worthington 3/60/2400 v.
125 K.W. F.M. 250 v. D.C.

RAYMOND MILL

5 Roll High Side.

CONVEYOR PARTS

BELT: 1000 Ft. 60 In., 700 Ft. 42 In., 600 Ft. 36 In., 800 Ft. 30 In., 1642 Ft. 24 In., 517 Ft. 20 In., 297 Ft. 18 In., 1000 Ft. 14 In. & 16 In.
IDLERS: 36 In., 30 In., 24 In., 20 In., 18 In.
Head & Tail—Pulleys—Takeup for all sizes.
Steel Frames: 2,000 ft. 24 In., 30 In. & 36 In. Sections.

ROTARY DRYERS AND KILNS

36 In. x 20 Ft., 3 Ft. x 30 Ft., 4 Ft. x 30 Ft., 54 In. x 30 Ft., 42 In. x 24 Ft., 5 Ft. x 30 Ft., 5 Ft. x 16 Ft., 5 Ft. x 60 Ft., 6 Ft. x 60 Ft., 6 Ft. x 70 Ft., 70 In. x 40 Ft., 5x30 & 8x84 Double Shell Dryers, 8x110, 7 1/2x100, 8x125 & 10x20 Kilns.

STEEL DERRICKS

GUY: 8 Ton 85 Ft. Boom, 15 Ton 100 Ft. Boom, 20 Ton 115 Ft. Boom., 50 Ton 100 Ft. Boom.
STIFF LEG: 5 Ton 70 Ft. Boom, 15 Ton 100 Ft. Boom, 25 Ton 100 Ft. Boom, 75 Ton 135 Ft. Boom.

LOCOMOTIVES

DIESEL: 7—4 1/2, 8 and 15 Ton 36 & 42 In. Ga.
GASOLINE: 3 Ton, 5 Ton, 8 Ton, 12, 14 & 30 Ton.
STEAM: 9 Ton, 20 Ton, 40 Ton, 60 Ton & 80 Ton.
ELECTRIC: 2 Ton, 5 Ton, 8 Ton, 17 Ton & 40 Ton.

SCREENS

VIBRATING: 2x4, 3x6, 2x8, 3x8, 3x5, 4x5, 4x8, 4x10, 48x72. HUMMER, ROTEX, NIAGARA & ROBINS, LINK BELT & HURON.
REVOLVING: 3x12, 3x16, 3 1/2x18, 3x24, 4x16 4x20, 4x23, 4x24, 5x30, 5x20, 6x20.

SAND WASHERS AND CLASSIFIERS

4 LINK-BELT A-60 In. Classifiers.
7 ALLEN Cones 4 Ft., 5 Ft., 6 Ft., 8 Ft.
30" Reciprocating Plate Feeder.

RAILROAD CARS

12—50 Ton Cap. Battleship Gondolas.
7—50 Ton Can. Flat Cars.

SAUERMAN DRAG AND SLACKLINES

1— 3/4 yd. Gas 1—1 1/2 yd. Electric
1—1 yd. Electric 2—2 yd. 3 yd. & 4 yd. Electric

42 IN. BELT CONVEYOR

350 Ft. Barber-Greene Sectional Steel Frame Roller Bearing Belt Conveyor. New 1939.

JACK HAMMERS AND DRIFTERS

21 Worthington 169 Drifters.
12 Worthington 180 Drifters.
6 Gardner-Denver 15 Jackhammers.
45 Ingersoll-Rand Drifters S70, N75, X71, DA35.
11 Ingersoll-Rand S49 Jackhammers.

R. R. TRACK SCALE

125 Ton 56' x 10'6" Platform 4 Section.

WHIRLEY CRANES

5 Clyde 75 to 100 ft. Boom.

DIESEL UNITS

96 H.P. Waukesha Hesselman.
2—370 H.P. Chgo. Pneu. RHA45S, 360 rpm.
420 H.P. Sulzer, 1000 rpm.
600 H.P. B. & W. 550 rpm.

CONE CRUSHERS

Symons No. 5 1/2 and 7 Ft.

R. C. STANHOPE, INC.

(Cable Address: "STANEQUIP" New York)
Lincoln Bldg., 60 E. 42nd St., New York, N. Y.
Murray Hill 2-3075 or 2-3076

Bucket Elevators:
Continuous: 24"x60', 20"x40', 14"x60', 14"x35', 10"x40'.
Spaced: 18"x40', 16"x40', 16"x70', 12"x35', 10"x40', 8"x35'.
Enclosed: 14"x36', 14"x20', and 5"x13', 6"x30'.

Crushers:
Jaw: 36x24, 24x14, 26x12, 18x10, 16x9, 15x9, 10x4.
Gyratory: Kennedy #25, Traylor #8.
Rolls: Garfield 54"x20, Allis-Chalmers 36x16", Jeffrey 24"x30".
Mills: Bonnot Air Swept ball 54"x8' with air separator.
Jeffrey 36"x24" Hammer, type B.

Screen:
10 Hummer vibrating with V 16 heads.
2 deck Robins 4x8 Perfex shaking.
Deister Multrap single deck 3x5 vibrating with washer.
Link Belt single deck 3'x8' vibrating with feed gate.
Revolving: 5'x16', 4'x20', 3'x18', 3x16, 3x12, 30"x10, 26"x8'.

Railway:
1500 foot 24" track with curves and switches.
7—24" end dump 1/2 yd. cars.
5—24" V shaped 3/4 yd. side dump cars.
12—24" V shaped 1 yd. side dump cars.
5—24" V shaped 1 1/4 yd. side dump cars.
8—24" V shaped 3 yd. side dump cars.
2—30" gauge 2 ton Mercury Locomotives.
1—36" gauge 4 ton Vulcan Gasoline Locomotive.
1—36" gauge 7 ton Plymouth Gasoline Locomotive.
1—36" gauge 8 ton Whitcomb Gasoline Locomotive.
18 Ton Standard gauge Plymouth Locomotive.

Belt Conveyor Equipment:
Portable Jeffrey 16"x20' trough.
Portable Barber Greene 18"x44' trough.
Trough & return idlers for 12" to 30" belt.
120 head and tail pulley assembly for belt conveyors.
90/30" gravity rolls in 10' sections 5½" apart.
950' of 36" 6 ply conveyor belt.
24"x7' plate feeder, 36" Link Belt Apron Feeder.
14" belt feeder with magnetic pulley.

Miscellaneous:
Loomis Clipper Blast hole drill, gasoline.
Dragline buckets: 1 1/2, 1 and 1/2 yd.
Clamshell buckets: 1 1/2, 1 and 3/4 yd.
10 centrifugal pumps.
C-P 2 stage steam air compressor 1055 CFM.
B. B. 50 ton hinged 2 compartments bin.
5 ton Guy derrick, 50' boom, timber.
Koehring 28S and 14S batch mixers.
Ingersoll-Rand #24 & 25 oil furnaces.
Ingersoll-Rand air tanks 54"x10' & 42"x9'.
Storage Tanks, truck scales, overhead cranes.

G. A. UNVERZAGT

15 Park Row — New York City

SURPLUS EQUIPMENT

AIR COMPRESSORS, 2-Stage with Motor
3—IR Imp. Type 10, cap. 600 cu. ft.
1—Sullivan WN-31, cap. 982 cu. ft.

BOILERS, Kewanee Steam Heating
1—2300 sq. ft. Type 750C.
1—2090 sq. ft. with Oil Burner.

ELECTRICAL EQUIPMENT
3—300 KW, 600 V GE Rotary Converter.
1—300 KW, 600 V GE Switchgear (new).
3—300/450 KVA GE Transformers 22,000/445 V.
15, 25, 30, 50 & 200 HP. Electric Motors.

HOISTS
1—60 HP. Sauerman, PTE DD.
1—37 HP. Natl. 48 x 42 SD.
8—15 to 45 HP. Tuggers.
1—75 HP. Ottumwa 48 x 36.
1—100 HP. Ottumwa 54 x 78.

LOCOMOTIVES, Elec. and Steam
1—5-Ton, 36" Ga. 250 V Elec. Goodman.
3—50-Ton Std. Ga. Steam Baldwin.

PUMPS
1—1,000 GPM 325' Hd. Cent.
4—4" Dorreo Diaphragm.
2—3,000 GPM Deep Well.
1—1,000 GPM Deep Well.
1—1,650 GPM 2-Stage A-C.
3—Steam Pumps.

WAGONS, Crawler
10-Yd. Patt. Side Dump.
16-yd. Athey 2-Way Side Dump.

BUCKET ELEVATORS: Steel 320 Ton Cap.
CONVEYORS: Goodman A&B Shaker
CRANES: 2—20-Ton Loco. Type Std. Ga.
CRUSHER: 2' Coarse Cone Std. Hd.
GOLD MACHINE: Ainley 4-Bowl.
JACK HAMMERS: RB 12 Auger L.H.
JIGS, ORE: 2-Cell Bendelari & Wood.
ROD MILL: Marcy 4 x 10 RH.
SCREENS, Revolving: 1—5'x8' Trommel.
SHOVEL: 3½-Yd. Diesel on Cats.
TRACK SCALE: 28' Rail 100-Ton Cap.
TRACKSHIFTER: Std. Ga. Model N.
WATER TANK: 10,000 Gal. Steel.

BUTLER BROTHERS

PRODUCERS OF IRON ORE

137 East 8th St. — St. Paul, Minn.

Used Equipment For Sale

This equipment located at plants of Muskogee Gravel Company, near Muskogee, Oklahoma.

Cranes
1—Orton-Steinbrenner, 1¼ cubic yard Track Crane, with 50 foot boom. This machine has been converted into a gasoline powered unit by Installing a caterpillar 60 H.P. Motor, chain driven. It is now in operation and will have to be seen perform to appreciate its efficiency. In good mechanical condition.
1—⅝ cubic yard, crawler type, 35 foot boom, crane, made by General Excavator Company, in good mechanical condition.
1—½ cubic yard, crawler type, 30 foot boom, three quarter-swing, Byers Manufacturing Company.

Dredge Pumps
1—V-Belt driven—8" Morris, heavy duty.
1—Belt driven—6" Morris, C. I. Pump.
1—Belt driven—3" Centrifugal Pump.

Derricks
1—Fabricated Steel Stiff-Leg, 70' Boom.
1—Fabricated Steel Guy Derrick, 80' Mast.

Hoists
1—Double Drum Hoist—Steam Power.
1—Double Drum Hoist—No Power Unit.

Buckets
1—2 cubic yard Drag Line Bucket, with carriage.
1—1 cubic yard Clamshell.
1—⅝ cubic yard Clamshell.

Crusher
2—9" x 16" Jaw Crushers.

Bucket Elevators
1—70' length of 9"
1—80' length of 12"
1—60' length of 16"
All on belts. Gears and pulley for each

Screens
1—4' x 12' Revolving Screen.
1—6' x 3' Shaker Screen.

Cutter
1 Diamond Cutter—Length 30'—For 10" dredge boat.
This is surplus used equipment on hand and can be bought worth the money.

MUSKOGEE GRAVEL COMPANY

321 Commercial National Building
Phone 4085—Muskogee, Oklahoma

OWENS *hit* 'PAY DIRT' *every time*

Profitable bucket operation is dependent in a great measure on the ability of the bucket to penetrate deeply into material being excavated or rehandled; to exert a powerful closing force and to lift "A Mouthful at Every Bite." Resultant performance with "More Bites per Day" and long bucket life substantiate the claim that OWENS hit "Pay Dirt" every time.

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Index to Advertisers

Alloy Steel & Metals Co 126
*American Cable Div. American Chain & Cable Co., Inc., Inside Back Cover
*American Chain & Cable Co., Inc. 16 Inside Back Cover
*American Pulverizer Co 68
Anchor Concrete Machy. Co 110
Atlantic Equipment Corp 138

Bacon, Inc., Earle C 100
*Barber-Greene Co 123
Baughman Mfg. Co 134
*Bethlehem Steel Co 4
Birmingham Rail & Locomotive Co. 140
*Blaw-Knox Co 137
Broadcast Section 138-143
*Brooks Equipment & Mfg. Co 66
Buckeye Traction Ditcher Co 23
Bucyrus-Erie Co 121
Bucyrus-Monighan Co 121
*Buell Engineering Co., Inc 64
Burnham, Royal E 142
Butler Brothers 143

Carlyle Rubber Co., Inc 143
Caterpillar Tractor Co 9
Chain Belt Co 113
*Chicago Bridge & Iron Co 57
Chicago Perforating Co 102
*Chicago Pneumatic Tool Co 130
*Chicago Steel Foundry Co 97
Cleveland Wire Cloth & Mfg. Co 133
Coast Metals, Inc 128
Consolidated Products Co., Inc 140
Construction Machy. Co 118
Continental Gin Co 56
Cooper-Bessemer Corp 103

Davenport Locomotive Works 132
*Deister Concentrator Co 102
*Dempster Bros., Inc 24
*Denver Equipment Co 5
DeWitt Operated Hotels 122
*Diamond Iron Works, Inc 132-138
*Dixie Machy. & Mfg. Co 96

Dreifus Co., Charles 141
Dunn Mfg. Co., W. E 117

*Eagle Iron Works 126
*Easton Car & Constr. Co 70
*Ensign-Bickford Co., The 125
Equipment Corporation of America 139

Fiske Brothers Refining Co 131
Flexible Steel Lacing Co 135
Frog, Switch & Mfg. Co., The 98
*Fuller Co 19

Gardner-Denver Co 128
Gates Rubber Company 13
Gay, Rubert M., Div. Universal Road Machy. Co 137
*General Electric 20-21
Goodall Rubber Co., Inc 99
Goodyear Tire & Rubber Co 2
*Gruendler Crusher & Pulverizer Co 90

*Haiss Mfg. Co., Inc., Geo 25
*Hardinge Company 90
Harnischfeger Corp 137
*Hazard Wire Rope Div. of American Chain & Cable Co., Inc 16
*Hendrick Mfg. Co 134
Hoffman Bros. Drilling Co 142
Hotel Philadelphian 132

Industrial Brownhoist 133
*Ingersoll-Rand 27
Iowa Mfg. Co 6-7

*Jackson & Church Co 119
Jaeger-Lembo Machine Co 141
*Jaeger Machine Co 114-115
*Jeffrey Mfg. Co 116
Jones & Laughlin Steel Corp 137

Kansas City Hay Press Co 134
*Kennedy-Van Saun Eng. & Mfg. Co. 72
Kent Machine Co 110
Keystone Driller Co 95
Kirk & Blum Mfg. Co 108
Kramer Corporation 112

*Laughlin Co., Thomas 93
Le Tourneau, Inc., R. G 10
Lewistown Foundry & Machine Co 134
Lima Locomotive Works, Inc. 133-141
Lime & Hydrate Plants Co 68
*Link-Belt Co 135
Lippman Engineering Works 141
Ludlow-Saylor Wire Co. Inside Front Cover

Marion Steam Shovel Co 15
McGann Manufacturing Co 68
*McLanahan & Stone Corp 132
*Merrick Scale Mfg. Co 71
Miles Mfg. Co., The 116
*Morris Machine Works 131
Morse Bros. Machy. Co 141
Mortarless Tile Machine Co 117
*Multiplex Concrete Machy. Co 116
Muskogee Gravel Co 143

National Supply Co., The 14
Naylor Pipe Company 129
New Holland Machine Co 98
*Nordberg Mfg. Co 26
Northwest Engineering Co 28

*Owen Bucket Co 144

Page Engineering Co 129
Pennsylvania Drilling Co 142
*Pioneer Engineering Works 124
Plymouth Locomotive Works 97

*Quaker Rubber Corp 22
Quinn Wire & Iron Works 118

Railway Accessories Co 138
*Ransome Concrete Machy. Co 105
*Raymond Pulverizer Div. of Combustion Engineering Co., Inc 60-61
*Robins Conveying Belt Co 30
*Roebling's Sons Co., John A 95

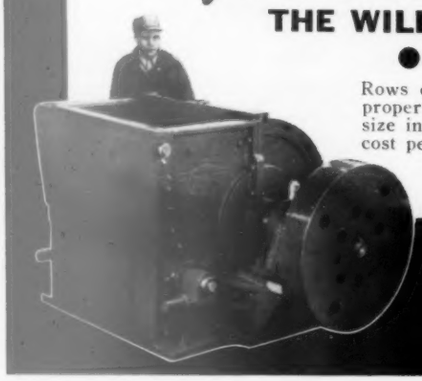
*Sauerman Bros., Inc 118
Schramm, Inc 92
Sherman Concrete Pipe Co 117
Simplicity Engineering Co 104
SKF Industries, Inc 8
*Sly Mfg. Co., The W. W 11
Smidth & Co., F. L 49
Smith Engineering Works 17
*Smith Co., The T. L 119
Southern Iron & Equipment Co 141
Sprout Waldron & Co., Inc 134
Stanhope, Inc., R. C 143
*Stearns Mfg. Co 120
Stephens-Adamson Mfg. Co 1
Stonex Industries 117
Stoody Company 130
*Stulz-Sickles Co 135
*Sturtevant Mill Co 50
Superior Engine Division The National Supply Co 14
Syntron Company 118

Taylor Forge & Pipe Works 94
Thew Shovel Co 3
Thornton Tandem Co 101
*Traylor Engineering & Mfg. Co 127
Twin City Iron & Wire Co 134
*Tyler Co., The W. S 100

Union Wire Rope Corp 135
*Universal Concrete Pipe Co 110
Universal Crusher Co 12
Universal Road Machy. Co 137
*Universal Vibrating Screen Co 134
Unversagt, G. A 143

Walsh Co., R. P 141
Wellman Engineering Co 127
*Western Precipitation Corp 91
*Williams Pat. Crusher & Pulverizer Company 144
Worthington Pump and Machy. Corp ..... Back Cover

***See also Detail Information in the 1941 Pit and Quarry HANDBOOK**



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● Handles Large Stone or Screen Rejects ●

Rows of heavy, free swinging, fast revolving hammers, crush the material by impact until of proper size to pass through the grates. By reducing large rock to 1¼", ¾" or agricultural size in one operation, the "Slugger" has enabled operators to produce these sizes at a very low cost per ton and with small investment. Seven sizes—6 to 150 tons hourly capacity.

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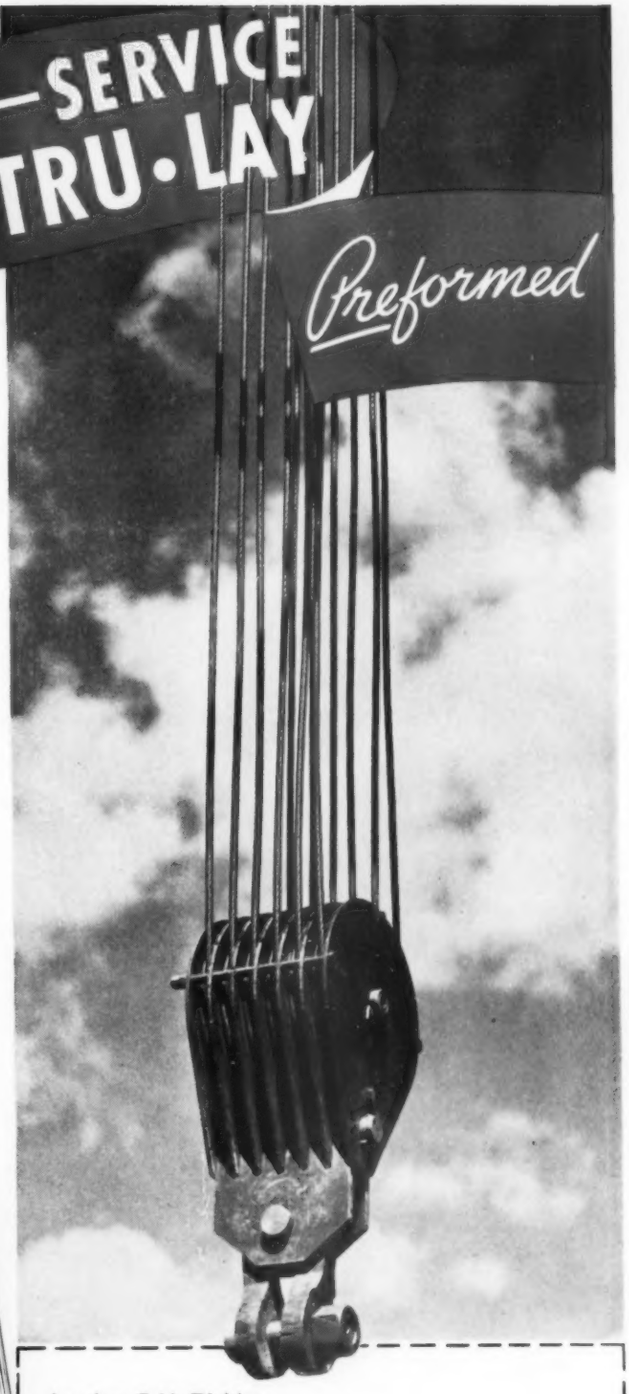

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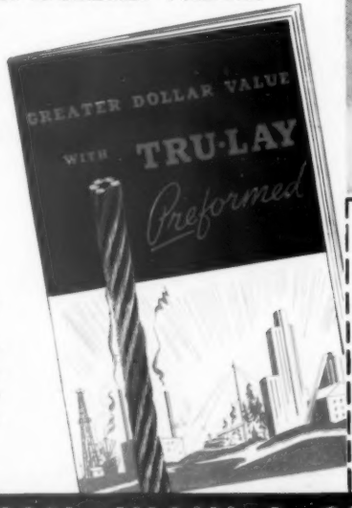

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WILKES-BARRE, PENNSYLVANIA

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American Chain & Cable Company, Inc.
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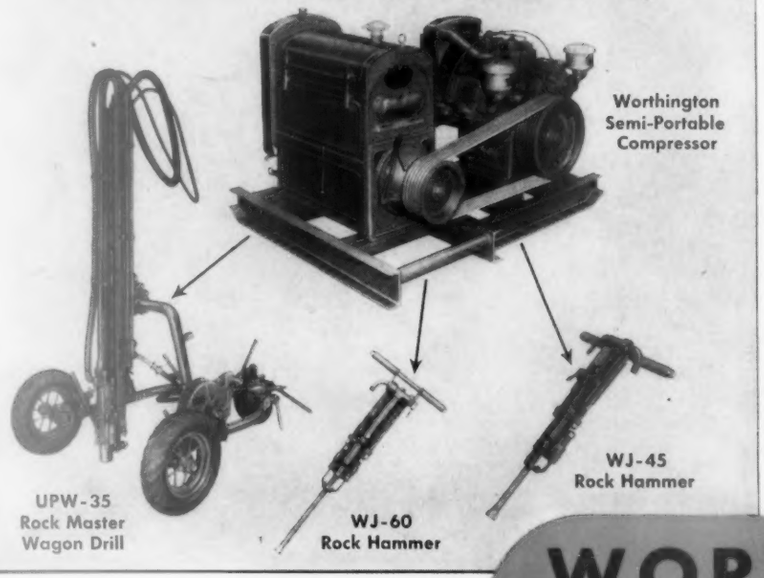

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DESIGN: Skilled, scientific designing results in low air consumption, high rate of penetration—and a tool that is easy on the operator.

QUALITY: Forged steel throughout, precision-made parts, and highest skilled workmanship guarantee ruggedness, long life and low maintenance.

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- TWO STAGE AIR COOLING
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- ENCLOSED CLUTCH
- SEALED CRANK CASE
- UNIT ASSEMBLY
- SIX-CYLINDER ENGINE
- SECTIONALIZED RADIATOR AND INTERCOOLER
- STRUCTURAL STEEL ALL-WELDED FRAME
- ROLLER BEARING WHEELS

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Address Inquiries to

HOLYOKE COMPRESSOR AND AIR TOOL DEPARTMENT

HOLYOKE, MASSACHUSETTS

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